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目录与摘要

内容提要：长期以来国内经济史学界和经济学界学者自说自话，鲜有沟通管道，两界难以实现吴承明先生倡导的“源与流”之顺畅联系。源与流不能有效沟通之尴尬局面的症结在于，经济史学界与经济学界的研究范式存在着巨大差异。本文认为，经济史研究应遵循经济学的研究范式：前提假设—逻辑推理—实证检验，而在这一范式的各环节上选择何种分析工具，则可见仁见智。

Abstract: Ever since a long time ago domestic economic historians and economist always speak on their own terms. It is difficult to come it true for the two parties that economic history should be the source of the economics on the initiative of Mr. Wu Chengming. The crux of the problem is that research methods are so different between economic history and economics. This paper thinks economic history should adopt economics research method: assumptions, logical reasoning, empirical test. As to the choice of the analysis tool is open to interpretation.

内容提要：太平天国战争究竟造成了多少人口损失一直是历史学家、人口学家争论的重点问题。本文利用唯一的清中叶至晚清人口面板数据，通过构建双重差分模型（difference-in-differences）对发生于 19 世纪中叶的太平天国战争与主要战争区域内人口损失的因果关系进行重新估计。本文发现，太平天国战争对近代中国人口变化有显著的影响，受太平天国战争影响的区域与未受战争影响的区域相比年均人口增长平均减少了 25‰左右。并且即使在控制初始经济条件、地理因素、灾害程度等因素，以及采用工具变量进行两阶段最小二乘法进行考察的情况下，该结果依然显著。本文的分析结果揭示了太平天国战争对近代人口损失的净影响，在对现有人口史学家估计结果进行修正的同时，也丰富了有关中国在 19 世纪是否存在马尔萨斯陷阱的讨论。

Abstract：The effect of the Taiping Rebellion on population loss in modern China has been a subject of ferocious debate. Using a unique prefectural panel data on population during Qing dynasty, this paper employs difference-in-differences and instrumental variable approaches to re-estimate the causal relationship between the Taiping Rebellion and population loss in modern China. We find that the prefectures which are occupied by Taiping troops have lower around 25‰ average annual population growth rate than those which failed to be occupied. This finding not only revises the existing estimates on the effect of Taiping Rebellion on population loss, but also enriches the relevant discussion on whether there is Malthusian trap in the 19th century China or not.

Abstract：We show how the silver standard transmitted world silver price fluctuations into China and made the Chinese price level closely linked to the world silver price. Inflation was transmitted between 1929 and 1931 when the world silver price was falling; while deflation was transmitted during 1932 and 1934 when the world silver price was rising. Using micro-level evidence and counterfactual simulations, we show that the exchange rate was the main shock transmission channel, and silver stocks played an insignificant role.

内容提要：本文揭示了银本位制是如何将国际银价波动传导到中国，使得中国物价与国际银价紧密联系的。1929 至 1931 年间，国际银价下跌，引起通货膨胀；而 1932 至 1934 年国际银价上涨，则带来一波通货紧缩。使用微观层面数据和反事实模拟，本文指出汇率是主要的冲击传导渠道，白银储备在其中只扮演了次要角色。

对“经济史应当成为经济学之源”理念的思考

——谨以此文纪念吴承明先生

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内容提要：长期以来国内经济史学界和经济学界学者自说自话，鲜有沟通管道，两界难以实现吴承明先生倡导的“源与流”之顺畅联系。源与流不能有效沟通之尴尬局面的症结在于，经济史学界与经济学界的研究范式存在着巨大差异。本文认为，经济史研究应遵循经济学的研究范式：前提假设—逻辑推理—实证检验，而在这一范式的各环节上选择何种分析工具，则可见仁见智。

关键词：经济史 经济学 吴承明 研究方法 分析工具

吴承明先生（2006）曾在许多场合讲过，“经济史应当成为经济学的源，而不是经济学的流”。多年来，这一理念始终为国内经济史学界众多学者所接受，在许多文献中都可以看到赞扬和诠释。但是，绝大多数文献都停留在呼吁和号召的层面上，而将这一理念付诸研究过程或提出可操作的研究路径者却很少见到，国内学界长期以来的实际情况是“源”与“流”之间鲜有沟通管道，经济学和经济史两界学者自说自话，难以体现上下游之间的顺畅联系。以中国近代经济史为例，学界惯常的研究路径是，就时下经济中的某一热议问题——如房地产、“三农”、基础设施建设、股市等——做民国或晚晴时期同一问题的论文，文中大都声称为当今提供借鉴。但是，由于作者对经济运行逻辑知之甚少，所以，论文描述的基本因果关系和所用数据的统计口径等规范性元素与经济学涵义相去甚远，经济学界无法参考借鉴。于是，当“源”不能为“流”提供“达标水”时，经济学界一旦需要借鉴历史经验，大都是自己动手。如，经济学家陈志武近年来正率团队研究整理中国 1700 年以来的时间序列利率数据，其原因自不待言——中国近代经济史文献无法提供这类数据。又如，新中国成立以来中国近代金融史研究开展了几十年，但尚无学者估算货币供应量时间序列数据，目前学界引用的近代中国 24 年的货币供给量是美国经济学家罗斯基（1989）估算了的。虽有一定瑕疵，但终强于无据可循。众所周知，离开货币量数据，绝大多数经济问题是讲不清楚的。不可否认，也有经济学界学者轻率地使用经不起推敲的历史数据，进而得出令人遗憾的结论之案例。如财新网报道，香港大学许成钢教授 2011 年 7 月 5 日在北京出席 IEA 第 16 届全球大会时谈到了中国经济总量在世界上的地位问题：“从最近的 30 年或者 50 年来看非常了不起，但把历史拉开来看，只是相当于中等程度的恢复。1913 年美国 GDP 世界第一，中国第二，只看这个指标，中国终于回到了 1913 年时在国际间的地位。但从绝对数量上看，2010 年中国 GDP 约为美国的五分之二，还不如 1913 年。按照比较乐观的估计，2025 年中国 GDP 会成为世界第一，即便如此，中国也只是达到了 1880 年的状态，当时中国已经是世界最大的经济体。”[①]许成钢先生的数据不知出自何处，令人惊讶。在前辈学者研究成果的基础上，我们（刘巍、陈昭，2012）对 1887~1936 年间缺失的 40 个数据做了初步的估算，形成了一个 50 年时间序列数据。笔者（2013）所做的比较研究结论是，1913 年中国不是第二，1880 年也不可能是第一。

凡此种种，不一而足，可见，在国内学界，有效沟通“源”与“流”，且保证“源”之水能为“流”所用，是当务之急。既然学界同仁对吴老提出的理念从无异议，于是，呼吁号召就嫌多余了，本文拟就有效沟通源流的思路抒发一孔之见，藉以纪念学界泰斗吴承明先生。

[①]详见 http://overseas.caing.com/2011-07-05/100276240.html，且国内各大网站相关栏目多有转载，影响较大。

一、经济史研究范式思考：“史无定法”大义浅读

从国内学界源与流不能有效沟通的现状来看，笔者认为，经济史学界与经济学界研究范式的巨大差异是源与流尴尬局面的症结所在，同时，问题在于经济史学界。经济史学界一些学者片面地解读吴承明先生提倡的“史无定法”理念，常对此说望文生义，进而作为事实上不懂经济研究方法和分析工具的搪塞，通常凭聪明和灵感对经济史做出朴素的或想当然的解释，研究结论常常令经济学界茫然不解。这犹如不大懂化学的人按自己的观察写出的化学实验报告和实验结果分析，化学家对这份文件是不会感兴趣的。

我们知道，经济史研究过程不是信马由缰的，研究者事先必有某种思路。于是，经济史文献中使用的历史资料必然是研究者精心选择的，基本适合研究者的研究思路。但是，如果研究者对经济运行逻辑关系知之甚少或浑然无知，那么，所选资料用处不大就是大概率事件了。南开大学经济研究所王玉茹教授在笔者的《中国货币供给机制研究：历史、逻辑与实证》一书序言中做了如下比喻：“我们不妨虚拟两个实验。实验 1：让一个军事院校战争学资深教授率领的研究团队研究二战史，同时，让我本人率领的另一个团队也研究二战史，两家收集、整理和推测的资料应该是有很大差别的。原因在于，前者头脑中的军事理论根深蒂固，研究框架几经锤炼日臻成熟，需要何种资料，如数家珍。而我收集、整理的资料集与前者资料集的交集不会很大，原因自不待言。实验 2：让一个美术学院的资深教授领导一个团队研究 1840 年以来中国油画的发展历程，让刘巍也率团研究同一课题。显然，这两个团队收集、整理的资料之差异要显著大于实验 1。”

从研究范式差异这一起点开始，经济史和经济学两界学者必然渐行渐远。那么，吴承明先生提倡的“史无定法”究竟涵义如何呢？笔者虽与吴老相识，也曾多次得到吴老的指点，且吴老是笔者博士学位答辩委员会主席，但是，笔者毕竟没有就“史无定法”之涵义一题向吴老做过专门请教。于是，以下对吴老主张的“史无定法”理念之理解纯属笔者演绎，荒谬之处在所难免。

首先，“史无定法”是大视野的理念。历史是对既往人类活动场景的记述，绚烂多彩，人们从各个角度研究，产生了诸如外交史、战争史、农业史、音乐史、哲学史等“泛历史”分支。如今早已不是司马迁写《史记》的时代了，科学发展突飞猛进，理应有各个角度的方法，不可能也不应该一致。各个研究角度既然有客观的运行规律，就必有反映和继续探索这些规律的逻辑框架及研究范式。于是，研究各种专门史的方法应该有特定的一种或数种，即在某一专门史领域中，方法应该是长期积累形成的特定范式。比如，研究音乐史不可能用外交史的研究方法，研究农业史不可能用哲学史的方法。因此，笔者认为，大视野的“史无定法”理念中蕴含着特定领域的“史有定法”。

其次，经济史研究与经济学研究是不能割裂的。经济学产生至今已有 300 年左右的历史了，当年威廉 配第、“经济学之父”亚当 斯密、大卫 李嘉图、边际革命三杰等著名学者研究的经济学，就是我们今天视野中的经济史（也包括经济学说史）。不仅如此，就连“现代经济学之父”凯恩斯的重要研究对象——大萧条，也成了今天经济史家不倦探索的领地。这些前辈经济学大师的研究方法体现在他们的宏论之中，是传世经典。吾等后辈学人今天在研究他们那个时代的历史经济运行，若连他们的研究方法和分析工具都不掌握（虽有些分析工具今天已显落后），甚至看不懂他们的文献，岂不汗颜。学术发展是需要传承的，若某一代人不能从前辈学者那里继承、发扬和创新充满智慧的技法，学术研究水准必将倒退。试想，假如一个人立志研究数学，但对笛卡尔的解析几何、牛顿的微积分既一无所知又不屑一顾，自己另起炉灶，即使此君终日悬梁刺股，又能有多大成就呢？

吴承明先生认为，“经济史研究历史上各时期的经济是怎样运行的，以及它运行的机制和绩效。依此定义，我们研究的视野就不能限于经济本身，因为自然环境、国家、社会和文化都制约着经济的运行，而经济运行的绩效也在自然环境、国家、社会和文化上表现出来。”[①]从吴老的定义和释义中可以读出，经济史研究和以往各个时代经济学界对他们的

[①]吴承明：《经济史：历史观与方法论》，上海财经大学出版社 2006 年，第 179 页。

“当今”经济运行研究极为相似。笔者对吴老所言之放开“研究视野”的感受是，任何一个历史阶段的经济运行必然受制于或受益于自然环境、国家、社会和文化等因素，即在不同的自然环境、国家、社会和文化背景之下，各不同历史时期的经济运行方式不同，经济机制的传导路径不同，经济绩效的高低不同。而宏观经济绩效的累积效应必然促使自然环境、国家、社会和文化等因素发生变迁，进而对下一阶段的宏观经济运行提供大背景。总之，既然经济史的研究内容是历史上的经济运行，无论从何种角度的展开研究，必然逼近和最终深入到经济运行逻辑之中。因此，经济学的方法应该是经济史研究的核心方法。在《经济史：历史观与方法论》一书的第六章到第九章中，吴老将经济史研究的方法总结为经济学方法、社会学方法、计量分析方法和区域比较方法四种，除去社会学方法之外，其余三种都是大经济学研究方法的子类。同时，应用社会学方法研究经济史也不能独立于经济学逻辑之外，因为研究对象毕竟是历史经济运行，所以，对经济运行逻辑的拒绝无疑会阻碍研究者得出正确结论。

最后，经济史的研究方法与经济史的分析工具是不同层次的概念。从科学研究方法论角度观察，方法应该是上位层次概念，属于如何梯次展开研究过程的理念或范式；而分析工具则应该是在某种研究理念或范式之下，研究者选择的架构完整的分析手段，如新古典的或现代经济学理论框架，数量分析工具或博弈论分析工具，等等。在一定的方法（理念或范式）之下，可选择的工具很多，但工具本身不是方法，虽然在口语中常常将二者混淆。譬如，在实证主义理念下，经济分析遵循“前提假设—逻辑推理—实证检验”这一范式进行，这是目前主流经济学的研究方法。在这一范式的“逻辑推理”环节上，研究者根据不同的前提假设可选择不同的理论框架作为分析工具，推出最终结论。接下来，在“实证检验”环节上，根据资料情况，研究者可以选择数量分析工具做实证，也可以选择案例分析做实证；如果实在缺乏条件，也可以暂时不做实证，将逻辑推理的结论暂且作为“假说”，待有条件时再做实证。但是，无论怎么变换分析工具，实证主义的研究方法并未发生改变，若研究者不走实证主义路线，那才是研究方法发生了变化。纵观近年来经济史学界对于研究方法的诸多讨论，笔者认为，许多文献的“方法”内涵差异很大，且有大词小用之嫌。

二、经济史与经济学： 研究范式对接与研究领地拓展

和大约 30 年前的索洛教授一样，笔者也来谈谈经济史与经济学的研究内容。索罗（1985）撰文批评过美国计量经济史学派，吴老在《经济史：历史观与方法论》一书中谈及方法论时，对索洛的论文做了客观的介绍。索罗认为，美国新经济史受到了经济学的损害，虽然也从经济学中得到了营养。索洛的批评主要是针对新经济史学家也和经济学界一样研究整合、使用回归分析工具和“用时间变量代替思考”，他认为，经济史家应该从社会制度、文化习俗和心态层面给经济学提供广阔的视野。他虽然赞成经济史家利用经济学家提供的分析工具，但认为不应还给经济学家“同样一碗粥”，即经济史家应该用经济学的烹饪技艺做出几道新的大菜，从而令经济学家惊奇，而不是重复着经济学的菜单。

虽然吴老在书中对其他学者的观点也有详尽的介绍，但是，中国经济史学界却经常引用索洛的宏论而非其他著名学者的，其意无疑在于否定用经济学工具研究经济史的“新潮”。然而，用某甲的言论否定或肯定某乙的研究范式是最不科学的，除非某甲是万能的上帝。尤其不可取的是，用某甲若干年前的宏论作为考量某乙若干年后研究工作的尺度。作为 1987 年诺奖得主，索洛 1985 的观点无疑有较强的公信力，而且可能反映了当时的实际情况。但是，值得注意的是，1985 年美国新经济史的年龄不过二十几岁，阅历尚浅，“从社会制度、文化习俗和心态层面给经济学提供广阔的视野”这一重任对于新经济史学派力所难及。从新经济史学派的学术发展路径观察，正是由于新经济史学派执着地使用经济学界提供的研究范式和分析工具，潜心做了历史宏观经济运行之类的基础性研究，包括索洛所批评的“研究整合、使用回归分析工具和用时间变量代替思考”，然后才有了对历史上“社会制度、文化习俗和心态”的深入研究。20 世纪 80~90 年代新经济史学派的领军人物、1993 年诺奖得主 D.诺斯对产权理论、国家理论和意识形态理论做出了巨大贡献，他的研究起点正是美国的航海运输史等经济史领域，若不采用经济学家提供的范式和工具，诺斯对新制度经济学的贡献难以想象。诺斯的贡献被当今经济学界广泛应用，这一贡献显

然不是经济学家们早餐中常见的“一碗粥”，而是做出了在经济学菜单上被忽视的大菜。假如索洛的论文在十年之后——1995 年发表，大概就是另外一种宏论了。

众所周知，诺斯的贡献是里程碑式的，诺斯一生恐难再有这样的贡献，就像索洛也难有超越“索罗模型”的贡献一样。不可能每一个经济史学家都会有诺斯那样贡献，就像不可能每一个经济学家都会有索洛的贡献一样。绝大多数新经济史学者在绝大多数时间里，做的研究还都是基础性的工作，科学研究不可能一蹴而就，要给新经济史以时日，要允许新经济史修补往日研究的不足，相信新经济史日后会不断丰富经济学家的菜单。新经济史在美国出现至今，尚不足 60 年；传到中国并被少数学者接受，还不到 20 年。笔者相信，随着时间推移和新生代学者的成长，中国计量经济史也能对中国经济学提供新的营养餐。从笔者近年的体会来看，国内学界许多激烈批评计量经济史的学者其实还未搞懂计量经济史的研究范式以及所用的分析工具。从我们对美国计量经济史文献的学习心得和我们自身的研究体会出发，本文将计量经济史研究范式归纳为以下几个重要步骤。

1.前提假设

一提起“前提假设”，就很容易招致攻击——“历史是不允许假设的”。但是，此假设非彼假设。计量经济史所说的“前提假设”是对研究对象所处的宏观经济环境的主要特征所做的简单抽象，这是研究的起点。要抽象宏观经济环境的主要特点，就必须查阅、分析大量的历史资料，否则，这一工作难以完成。我们是否可以这样认为，“历史不允许假设”中的“假设”大概是指虚构之意，计量经济史也是不同意虚构的，这没有问题。计量经济史的“前提假设”是对主要市场环境特点的抽象，是建立在大量史实基础上的，丝毫没有虚构的意思，批评者切不可望文生义。一般地，抽象前提假设主要是在以下几个层面进行：①总供求态势——是需求约束型经济还是供给约束型经济，即经济增长的发动机是总需求还是总供给？②经济的阶段性特征和结构性特征③经济制度安排和变迁的轨迹特征（正式约束）④居民的习俗、宗教和主流意识形态等（非正式约束）。看得出，这需要计量经济史研究者在大量阅读的基础上逐渐养成一种历史学家常说的“历史感”，这种历史感会帮助计量经济史学者区别主次，激发研究灵感。对于计量经济史学者来说，前提假设是最难做的，前提假设也是绕不过去的；前提假设是有所建树的起点，前提假设也是迈向错误深渊的第一步。若前提假设与历史经济环境很贴切，训练有素的计量经济史学者会用有效的逻辑分析工具得出合理的、有意思的结论；前提假设如果远离当时的经济环境，逻辑分析再精致，一般也不会得出有效的结论。

2.逻辑推理

在前提假设与历史经济状态一致或贴近时，通过较为缜密的逻辑推理，一般可以得出正确的结论。尤其值得强调的是，如果抽象出的前提假设与某一现成的经济理论框架设定的前提假设一致，我们就可以直接使用该理论框架，免去逻辑推理过程，因为经济学理论是数代经济学家潜心研究的结果，一般不会在逻辑推理方面犯低级错误。计量经济史研究者必须要熟练掌握发达经济学和发展经济学的理论，不仅要掌握各种理论框架的逻辑过程和结论，而且要对其前提假设有精准的把握。这样才能知晓在何种前提下何种影响因素能起作用，哪个前提不存在时，应该剔除哪个对应的影响因素。对于计量经济史研究者来说，通过研究经济学理论逐渐养成的经济学“逻辑感”是非常重要的，其重要程度至少不比“历史感”逊色。

诚然，逻辑推理过程中要使用有一定难度的数学工具，因为深藏在经济史表像背后的逻辑关系不是凭着肉眼看或用简单的加减乘除四则运算就可以得到的，必须将各变量符号化，使用相对高级一些的数学工具做分析方可拨云见日。传统经济史研究者最容易轻率地质疑（或公开批评）对这种逻辑推理方法，然而，这却是最不该质疑（批评往往也不得要领）的。一个合理的顺序是，先弄懂再质疑（或批评）。众所周知，科学研究中的一个大忌就是胡乱批评自己还不懂的东西。不可否认的是，在逻辑推理过程中，“炫耀数学技术”的倾向也是不可取的。我们认为，在能够解决问题的前提下，分析工具越简单越好，而不是越复杂越好，使用何种程度的数学工具要视对问题分析的深度而定，如果动用了高深的数学工具，得出的结论却是人所共知、人所共信的，那就太没必要了。使用高级分析工具，得出了简单工具难以发现或难以证明的结论才是合算的。

3.实证检验

实证检验是计量经济史学者“标志性”的研究手段，即用数据验证前面逻辑推理的结论之可靠性。若能通过检验，称为结论被证实；若未能通过检验，则必有某一分析环节出了问题，需重新做分析。这里所说的“以数据验证结论”是使用计量经济学方法所做的数量分析，俗称“做模型”。计量经济学分析方法最基本的功能是用一个时段内所有时点上的数据来验证某种因果关系，具有可重复性，能避免举例法的不完全性和研究者选择故事时的主观好恶，从而避免无谓的争论。数量分析结论不仅可以回答逻辑推理得出的因果关系能不能得到经验支持的问题，而且可以回答各个影响因素的敏感程度和重要程度的问题。成熟的计量经济史学者对于计量模型的建立和解释是相当谨慎的，没有见过哪一个计量经济史学者宣称数量模型可以代替经济史本身，更没有人宣称要用它建立新理论，这类批评完全是批评者的误解。作为经济史研究的一种分析工具，计量经济学的方法非常适合证实和证伪经济运行中各变量之间的逻辑关系，毫无疑问，这是目前其他研究方法望尘莫及的。计量经济史研究不可或缺的资料就是数据，没有数据就等于无米之炊。因此，中国近代计量经济史当前的主要任务之一就是数据建设。值得注意的是，某些经济领域的影响因素乍看上去确实难用数据表达，甚至有经济史名家宣称其不能数量化，我们不以为然。既然某因素影响经济，那么就必然会在某一数量指标上反映出来，关键是如何找到或构造出这个统计量，这需要有统计学的扎实功底和良好的智商。如果某因素确实任何数量指标也不影响，那就是对经济没有影响，直接剔除就行了。只要是经济的影响因素，就应该可以量化，你我不能量化不意味着他不能量化，过去不能量化、现在不能量化也不意味着将来不能量化。

综上所述，计量经济史研究的标准范式是“前提假设——逻辑推理——实证检验”。前两个环节要求研究者具备历史学和理论经济学的功底，后一环节要求研究者具备统计学和计量经济学的的良好修养。可见，研究计量经济史不仅仅是会不会“做模型”的问题，而是要迈过这理论经济学、历史学和计量经济学这几门功课共同设置的“门坎”。

三、经济史研究的最高境界：修正、补充或构建经济学理论

无论从吴承明先生的“经济学之源”角度讨论，还是从前引索洛的宏论分析，经济史研究的最高境界是修正、补充或构建经济学理论。著名经济史学家刘佛丁教授一贯倡导经济史研究绝不应该是仅仅讲述经济史故事，而应该致力于补充、修正和发现经济学理论的前提假设，即研究经济学理论框架的适用条件，为当今经济当局实施宏观经济调控政策提供理论依据和剔除前提假设与当前宏观经济运行环境不一致的经济学教条。[①]这一理念和吴老的“源流”之说不谋而合。但是，由于受到诸多条件限制，这一研究导向的身体力行者不多见。

近年来，笔者及所在的团队——广东外语外贸大学计量经济史研究中心——虽远未到构建理论的境界，但遵循刘佛丁先生的遗训对一些经济学理论发出了质疑和尝试做了粗浅的讨论，成文的浅见主要集中在在以下方面（详见《中国计量经济史研究动态》各期[②]）：

第一，经济史进程中的阶段性特征研究。任何一个经济学理论均产生于特定的历史阶段，而产生于特定历史时期的经济学理论之前提假设（明确的或暗含的）与后来的宏观经济运行环境未必一致或贴近，因此，从先前形成的经济学理论中衍生的经济政策未必都能奏效。广东外语外贸大学中国计量经济史研究中心将近代至今的世界经济史分成三个阶段：

1.供给约束型经济。这一阶段的特点是“短缺经济”，总供给的物质构成完全与总需求吻合。虽然总需求并不旺盛，但由于供给不足，销售没有任何问题，总需求总是被迫适应总供给。简单说就是，低下的总产出不能满足消费者低水平的购买。政府若干预经济，一般是压制本来就水平很低的消费，鼓励投资或引进外资。

2.需求约束型经济。这一阶段潜在总供给能力强大，且总供给的物质构成完全与总需求吻合，只要有订单，厂商就能供给产品，销售成了企业最大的问题。简言之，总供给总是

[①] 由于刘佛丁先生英年早逝，这一理念并未成文。笔者作为刘先生的弟子，有幸面聆教诲，只是希望没有误会先生的要义。

[②]见中国计量经济史研究中心网站： http://www2.gdufs.edu.cn/wtoresearch/xueshuchengguo123.html

被迫适应总需求。相对说来，只有消费者买不起的问题，而生产一端没有太大问题。政府管理经济的手段一般是扩大外需和内需，经济政策往往比较奏效，至少在短期中效果显著。

3.“新供给”约束型经济。这一阶段总供给能力虽强大，但其物质形态与总需求增长不吻合。国内需求只是在旧有的规模上循环，总供给的物质形态不能适应国内需求的增长。国内富裕的消费者不是买不起产品，而是没有什么新产品可以引诱消费者多买。处于这一阶段的国家经济增长只能依赖出口，一旦出口受阻，则 GDP 口径的总产出便陷入低迷状态，一切需求管理的政府经济政策均无显著的正面效果。通过对日本经济泡沫和“失去的二十年”的研究，从主流经济学的政策主张回推，得出了“凯恩斯的有效需求不足实际上是指有效内需不足”的结论。在政策意义上说，就是宽松的财政政策和货币政策不能治理外需不足导致的经济低迷。

我们的研究结论进一步指出，英国在维多利亚时代中期就从供给约束型经济过渡到了需求约束型；美国从 1919 年开始，完成了这一过渡；中国自近代至新中国改革开放前期，一直处于供给约束型经济态势下，直至 1995~1996 年方完成了向需求约束型经济的过渡；日本在 1950 年之后从供给约束型经济过渡到了需求约束型经济，20 世纪 80 年代中期则进入了“新供给”约束型经济。

第二，对某些国际贸易理论的修正。首先，贸易条件学说只适合于供给约束型经济，而在需求约束型经济态势下，已不适合作为考量国际贸易得失的尺度。对于绝大多数处于需求约束型经济态势下的国家（地区）来说，本币贬值虽恶化了贸易条件，却能改善贸易收支，减少失业和投资增长；本币升值虽改善了贸易条件，却恶化了贸易收支，造成国内失业增加和投资下降。最能说明问题的是，在需求约束型经济态势下倾销与反倾销在国际贸易中司空见惯。倾销无疑是倾销国主动恶化贸易条件，但由于在产能巨大的条件下仍可薄利多销，所以很多国家乐此不疲；被倾销国虽贸易条件得到改善，但由于本国产品市场被挤占，则坚决动用关税武器反击。

其次，在需求约束型经济态势下，比较优势理论“2×2 模型”无效，自由贸易理论的基石发生松动。在“2×2 模型”中，两国都生产自己又比较优势的产品，互相贸易，结果都比没有贸易时的收益大，其中暗含的假设是产品销售没有问题，李嘉图时代的销售也确实问题不大。在当今需求约束型的世界经济中，产品销售是大问题，“2×2 模型”必然崩溃。同时，在国家之间时常产生利益冲突、战争不断的前提下，“2×2 模型”更难顺畅运行。

第三，对某些货币理论的修正。首先，主流货币理论将货币政策喻为一根绳子，认为“可以用绳子拉车但不可以用绳子推车”，即在萧条时货币政策难以启动经济，必须依靠财政政策。广东外语外贸大学中国计量经济史研究中心的研究结论认为，上述理论源自 1929~1933 年美国大萧条的特例，不具有一般性。由于胡佛总统固守金本位制，美国的基础货币根本没有供给弹性；由于美国商业银行大量倒闭，“硬件”系统无法使货币乘数运行。因此，问题不在货币政策的软件本身，而是保证其运行的硬件系统出了问题。大萧条时期，同是需求约束型经济的英国于 1931 年实施了放弃金本位制的货币政策，经济便走出了低谷；处于供给约束型经济态势中的中国于 1933~1934 年发生了萧条，1935 年放弃了银本位制，经济增长重新开始。英中两国的共同特点是，货币供给有了充分的弹性，且商业银行体系均未遭受美国那样的重创。历史经验表明，货币政策也是可以引导萧条经济走出低谷的，用主流经济学家的话说就是“绳子未必不能推车”。其次，凯恩斯经济学在论述货币政策无效时论证了一个极端的假说——“流动性陷阱”：当市场利率（有价证券收益率）低到无可再低的水平时，公众将不再购买证券，当局无论投放多少货币，均会被货币需求吸收。于是，投资无法增长，经济不会走出低迷。通过逻辑讨论和对美国大萧条案例的分析，广东外语外贸大学中国计量经济史研究中心的研究结论认为，在金本位时期，经济中不存在凯恩斯“流动性陷阱”暗含的两个重要前提假设：其一，货币当局不具有持续增加货币供给量的能力；其二，有价证券市场上也没有一个“至低”的、公众一致不再购买证券的收益率。从逻辑层面分析，若第一个前提假设不存在，使“流动性陷阱”出现的可能性消失了——既然当局不能无限供给货币，那么，“货币需求可以吞噬任何数量的货币供给”就成了纯粹的想象或虚张声势。即使存在第一个假设——当局有无限供给货币的能力，但如果第二个前提假设不存在，“流动性陷阱”也不会出现，最多是有价证券交易量下降，而不会出现无人购买的惨状，宏观角度的短期收入摆布结构依然是货币和证券。从实证角度讨论，大萧条时期的美国货币当局不具有无限供给货币的能力，同时，1932 年

国库券到期收益率在 10~11 月低到了 0.01%时（股票的年平均收益只有 0.72%），股票交易量明显下降，国库券交易额却有所上升。也就是说，在经济萧条到如此悲惨的地步时，由于前提假设不存在，因此也就未能出现凯恩斯的“流动性陷阱”，其逻辑也就成了一个地道的假说——理论正确但理论无效。

再次，我们认为，近代中国法币改革前的货币有“不可控外生变量”之属性，是一种有害的货币供给机制。众所周知，货币理论界对货币供给的性质向有“内生性”和“外生性”之分，而我们根据货币理论对银本位制下中国货币供给的形成机制分析之后认为，近代中国的货币供给既无经典的“内生性”，也无经典的“外生性”，而属靠天吃饭式的“不可控外生性”。这一研究结论一方面暗示了法币改革的重大经济意义，另方面对经典货币理论提出了新意。

诚然，我们的研究刚刚起步，我们的团队实力尚弱。将不成熟的讨论结果在此做一总结归纳的意图有二：其一，供学界同仁品头论足，以便我们修正和深化；其二，对后来学人抛砖引玉，借而鉴之。

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The Thinking of Economic History Should Be The Source of The Economics
------ to honor the memory of Mr. Wu Chengming

Abstract: Ever since a long time ago domestic economic historians and economist always speak on their own terms. It is difficult to come it true for the two parties that economic history should be the source of the economics on the initiative of Mr. Wu Chengming. The crux of the problem is that research methods are so different between economic history and economics. This paper thinks economic history should adopt economics research method: assumptions, logical reasoning, empirical test. As to the choice of the analysis tool is open to interpretation.

Key words: economics history; economics; Wu Chengming; research method; analysis tool

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太平天国战争对近代人口影响的再估计：

基于历史自然实验的实证分析

李 楠 林 矗*

（上海财经大学 经济史学系，上海 200433）

内容提要：太平天国战争究竟造成了多少人口损失一直是历史学家、人口学家争论的重点问题。本文利用唯一的清中叶至晚清人口面板数据，通过构建双重差分模型（difference-in-differences）对发生于 19 世纪中叶的太平天国战争与主要战争区域内人口损失的因果关系进行重新估计。本文发现，太平天国战争对近代中国人口变化有显著的影响，受太平天国战争影响的区域与未受战争影响的区域相比年均人口增长平均减少了 25‰左右。并且即使在控制初始经济条件、地理因素、灾害程度等因素，以及采用工具变量进行两阶段最小二乘法进行考察的情况下，该结果依然显著。本文的分析结果揭示了太平天国战争对近代人口损失的净影响，在对现有人口史学家估计结果进行修正的同时，也丰富了有关中国在 19 世纪是否存在马尔萨斯陷阱的讨论。

关键词：战争，太平天国，人口损失

JEL 分类号：J01, N35, N45,

一、引言

战争、内乱作为影响人口增长的重要因素一直是人口学家、社会学家关注的重点内容。特别是人类历史上的历次大规模战争、社会动乱对人口的影响，不仅改变了现今世界地区间的人口分布，同时也对地区间技术进步路径、经济发展方式产生巨大影响（Voigtlander and Voth，2013；Acemoglu, Hassan and Robinson, 2011）。[①]19 世纪中叶中国爆发的太平天国战争正是这类历史事件之一。[②]太平天国战争历时 14 年，活动范围涉及 18 个省，造成了世界人类历史上最大的杀戮（Ho, 1959；Wakeman, 1997），其对近代中国人口及经济发展造成了不容忽视的影响（Fairbank and Liu, 1978；李楠、林矗，2013）。[③] 但如何造成这

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① 如 Voigtlander and Voth（2013）考察了黑死病、城市化以及战争通过对死亡率及工资率的影响，进而解释为何资本主义可以在欧洲兴起。此外，Acemoglu et al.（2011）也做了类似的研究。他们通过考察第二次世界大战德国对苏联犹太人的屠杀在战后的经济影响，强调了大屠杀对社会结构的改变对战后地区间经济发展产生了巨大影响。因此，战争不仅影响了人口增长率，也对经济的长期发展起了重要作用。

② 太平天国战争并非近代中国唯一造成千万以上人口损失的重大历史事件，其他的对人口造成大规模损失的历史事件分别为 8 年抗日战争时期、新中国建国初期 3 年自然灾害等。但是就其规模、持续时间以及死亡人数来看，太平天国战争持续的时间最长、波及的范围最广、损失的人口最多。

③ 在李楠、林矗（2013）最新有关太平天国战争对太平天国战争后经济发展长期影响的研究中发现：虽然太平天国战争发生于 19 世纪中叶，但其影响直至 20 世纪中叶依然存在。发生太平天国战争的区域与未发生太平天国战争的区域在城市化、人口密度以及近代企业集聚和发展方面存在显著差异。

样影响的机制依然不非常清晰，因此本文试图采用唯一的微观府级面板数据，从战争对人口影响的角度，对太平天国战争造成的近代人口影响进行科学系统的考察。

关于太平天国战争对近代中国人口的影响国内外已有众多学者进行了分析和讨论。如早期美国传教士 Happer（1880）在太平天国战争爆发后不久，即对其人口影响进行估计。他估算太平天国战争至少导致约 5000 万人的人口损失。而另一些学者则认为这个数字存在低估的可能。如葛剑雄、侯杨方、张根福（1999）认为这个数字应该至少在 1 亿人，超出 Happer 估计数量的一倍以上。尽管这些学者试图努力揭示太平天国战争对近代中国人口的影响，但是这些估计并没有获得令人满意的结果，依然受到很多人口史学者（如姜涛，2006；华强、蔡宏，2006 等）的批评，指出这些估计均是很不确切的估算，同实际人口损失存在较大差异。[①]因此，一些学者如 Ho（1959）很早就做出了将天灾、人祸作为人口学的因素进行统计分析是不可能的论断。

之所以认为这些关于太平天国战争对人口损失估计存在偏差或者不可能进行统计分析主要是基于两方面原因给出的判断。首先是因为缺乏系统化、真实可靠的数据统计资料造成的局限。这一方面是由于部分研究者所取材的一般的或官修的著作，在人口统计记录方面存在较大的随意性或漏报、瞒报突出，如湖北、江苏、江西等省官方人口数据主观臆造或漏报严重（曹树基，2001）；另一方面则是研究者对人口数据本身的错误理解造成的偏差，比如错误的将“丁”这个基本赋税单位简单理解为人口数量，进而采用“丁”的数量推算人口的损失等。其次则是研究方法上面的局限。特别是现有研究，仅仅利用太平天国战争爆发前后的差异配合一些方志记录进行估计。采用这种方法虽然可以看到不同地区人口因太平天国战争而受到损失，但是并不能得到太平天国运动对人口造成的净影响，即不能排除因为自然灾害、列强入侵以及爆发太平天国战争地区自身影响人口变化的因素对人口数量造成损失（华强、蔡宏俊，2006）。

关于人口统计资料的有效性与准确性问题，人口史学家已经做了大量的工作，成果颇丰。除了早期 Ho Ping-ti（1959）、Perkins（1969）等国外学者从制度角度对中国人口进行解读和重新估计外，当属曹树基（1997，2001）对中国清代人口进行了较为详细的考证与整理。特别是曹树基通过对方志资料以及 1953 年人口普查资料的系统分析，采用区域比较及人口自然增长率曲线平滑移动的方式对清代的人口存量进行重新估计，最终完成了以府为单位的较为科学可靠的人口数量审定与推算。而且在研究过程中，曹树基（2001）对作为太平天国主要战区的江苏、浙江、安徽等 7 省人口损失进行估计，最终估算为 7330 万人。虽然这个估计结果被很多历史学家或人口史学家所接受，但遗憾的是他的估算依然是建立在太平天国战前与战后的人口变化幅度推算的基础上，未能建立太平天国战争与近代人口损失影响的因果关系，识别不出战争对人口的净影响（曹树基等，1998，2000，2002）。

因此，本文在借鉴以往研究的基础上，采用唯一的府级微观面板数据，通过构建双重差分模型（difference-in-differences）来识别太平天国战争对近代人口损失的因果影响。通过对太平天国战争前后战争区域（实验组）和非战争区域（对照组）对比考察，重新估计了战争对人口的净影响。本文发现太平天国战争对中国近代人口具有重要影响，其中战争区域与非战争区域相比人口年均增长速度低 3%左右。该结果即使在控制了地区之间初始经济条件、地理因素、自然灾害等影响地区人口差异的因素，以及采用各府到南京城（太平天国国都）的欧几里得距离作为是否战争发生区的工具变量进行两阶段最小二乘估计后，该估计结果依然稳健显著。

根据本研究估计的人口年均增长速度，我们通过计算发现在太平天国战争时期，作为主要战争区域的人口损失约为 8210 万，而在众多学者讨论的受战争影响最大的江苏、安徽、浙江等 7 省战争导致人口损失大约为 5300 万。该估计结果不仅揭示了作为近代最大规模社会冲突的太平天国战争对人口损失的净影响，证明了现有研究存在高估的可能（如曹树基，1998，2001 等），并对其进行了修正；而且本文也丰富了有关中国在 19 世纪是否存在马尔萨斯陷阱的讨论。[②]

[①] 关于现有太平天国战争对人口损失估计研究成果的讨论参见华强、蔡宏俊（2006）《太平天国时期中国人口损失问题》一文。

[②] 有关中国十九世纪是否存在马尔萨斯陷阱的讨论参见曹树基、陈意新（2002）、Lee and Wang (2001)。

本文组织结构如下：第二部分主要是对太平天国战争及其对人口冲击的历史背景进行简要介绍；第三部分则对本文采用的实证模型、数据来源以及实证策略进行介绍与说明；而实证结果将在第四部分给出；第五部分则是根据第四部分得到的估计结果对死亡人口规模进行估计，同时对现有估计结果进行讨论；最后为本文的结论。

二、历史背景：太平天国战争的范围及影响

19 世纪中叶，中国社会陷入了较为沉重的自然灾害与社会危机之中，表现出全国混乱动荡的局面。不仅对外有鸦片战争以后同外国列强发生一系列冲突，对内则有天地会会党、捻军、西部回民和少数民族、太平天国等起义斗争，同时在光绪初年因降水较少导致的华北 5 省大旱灾。这些天灾人祸对近代中国人口增长以及经济社会发展形成了巨大冲击，而在这些天灾人祸中，当属爆发于 1851 年的太平天国战争影响最大。其不仅改变了近代中国地区间人口土地关系，同时也通过人口压力的调整对近代社会变迁起到了至关重要的作用（曹树基，1998）。[①]

太平天国战争始于 1850 年末至 1851 年初，由洪秀全、杨秀清等在传播上帝教基础上，组织团营，武力反对清政府揭开斗争的序幕。并于 1851 年秋，太平军占广西永安州（今蒙山县）后分封诸王，建立了初期的官制、礼制和军制，宣布建立太平天国。1852 年 4 月，太平军在永安突围后，继续北上进攻桂林，但未能攻克，进而从广西进入湖南。后于次年攻克南京，改称“天京”。太平天国定都南京后，先后又进行过北伐和西征，从而使太平天国武装力量先后发展到广西、湖南、湖北、江西、安徽、江苏、河南、山西、直隶、山东、福建、浙江、贵州、四川、云南、陕西、甘肃诸省，攻克过 600 余座城市。但随着战争的发展，特别是清政府任用曾国藩等民间团练力量和西方武装力量，1864 年太平天国首都天京陷落，进而标志着太平天国政权的结束。

太平天国战争对人口的影响主要表现在两个方面：一是战争对人口损失的直接影响，主要表现在战争过程中直接残酷的杀戮，包括发生重大战役、战斗等造成的大规模的人员伤亡。由于太平天国主要战争集中于安徽、苏南、浙西和湖北一带，因此这些地区受到战争直接影响的人口损失较为严重。如皖南广德县在这场战争中“居民遭荼，或被杀。或自殉，或被掳，以及饿殍疾病，死亡过半”[②]。据著名地质学家冯 李希霍芬（1871）对战后浙江和皖南的回忆情况，他“在不同地方打听到的太平天国战争中的幸存者的百分比，一般每百人中仅有三人幸存”，“很难想象比这些地区所遭受的更为可怕的生命财产的毁灭，但它们只不过是遭受同样命运的广大地区的很小一部分”[③]。江西、湖北同样受到严重的人口损失。例如在赣西的义宁县在 1855 年经过 21 天的激烈战斗城陷后，幸存者不足一万人。尸体被火化后被埋入一个大墓，后人称之为“十万人冢”。[④]二是战争对人口损失的间接影响。这主要是指战争对太平天国统治区人口增长的间接影响，特别是由于战争对生产生活资料影响而造成的人口数量的下降。如太平军于咸丰三年（1853 年）夺取南京后，战争形势从城池的争夺，转变为消耗性战。因此，清军与太平军双方均开始注意后勤粮食等物资的保障与供应。随着战局的发展，清军开始采取了坚壁清野的战术，对太平军的主要物资供给地如江西、湖北、安徽等地进行封锁和包围，企图饿死太平军。初期，太平军可以突破包围去安徽获得粮食补给，但到战争后期则变得非常困难。粮食的短缺与物资的匮乏导致太平军战斗力的下降。仅咸丰十一年（1861 年）冬，约有十万太平军因缺粮而饿死，同治二年（1863 年）又有同样情况发生（罗尔纲，1951）。而且这种坚壁清野的战术不仅在江南地区使用，淮河流域华北地区也进行推行，而且与江南地区不同的是，在淮河流域和华北地区不仅是清政府采用这一政策，太平军和捻军也采用这一政策（Chiang, 1954）。坚壁清野的政策不仅有效的削弱了太平军和清军的力量，但同时也对当地的百姓产生巨大冲击，造成当地百姓因为饥饿而死亡或营养不良。

[①] 以陕西为例，回民战争造成了该省人口损失约 466 万，其后的光绪大灾荒中又损失人口 243 万，累积损失大约 710 万。但与太平天国战争相比，这些叛乱和灾荒对人口的长期影响要小很多（参见，曹树基，2001）。

[②] 光绪七年《广德周志》卷 60，P25。

[③] 《浙江、安徽省书信》，冯 李希霍芬，1871，P12。

[④] 同治十二年《南昌府志》，卷 18，P68。

这种两种影响，无论是直接的杀戮，亦或是间接的影响，最终造成太平军活动地区大量的人口损失。从当时一些达成的奏折中可以看到当时战争对人口破坏之严重。如李鸿章在向朝廷汇报江苏省战后情况时说：

“查苏省民稠地密，大都半里一村，三里一镇，炊烟相望，鸡犬相闻。今则一望平芜，荆榛塞路，有数里无居民者，有二三十里无居民者。有破壁颓垣，孤鹜弱息，百存一二，皆面无人色，呻吟垂毙…”①

作为太平天国战争另一重灾区安徽也有如此情形，如时任两江总督曾国藩视察皖南时也有类似描述：

“自池州以下，两岸难民，皆避局江心洲渚之上……壮者被掳，老幼相携，草根掘尽，则食其所亲之肉，风雨悲啼，死亡枕籍……徽、池、宁国等属，黄茅白骨，或竟日不逢一人。”②

尽管以上转述用词有一定夸张的成分，但对于战争的残酷性以及对人口的巨大冲击略见一斑。此外，从现有人口史学家对战争的人口影响估计也可以看到这种冲击。如曹树基（2001）对作为太平军主要战场的江苏、浙江、安徽、江西等 7 省人口死亡估计就达到 7330 万。如果再考虑到太平天国战争的其他战场湖南、广西、福建、四川等省的人口损失，那么太平天国战争给中国带来的人口损失至少在 1 亿以上（葛剑雄、侯杨方、张根福，1999）。

三、模型设定、数据来源及实证策略

（一）实证模型设定

现有对太平天国战争的人口损失影响估计的研究中之所以存在偏差，其中一个主要原因是现有研究不能提供有效的检验太平天国战争对人口净影响的因果关系实证证据。幸运的是在经济学实证方法中双重差分（differences-in-differences）模型可以帮助我们有效识别这一关系。③ 19 世纪中叶的太平天国作为一种外生社会冲击仅对南方核心省份产生影响，如湖南、湖北、江西、江苏、浙江等，而对北方省份没有产生巨大影响，如山东、河北、山西等地的大部分地区。因此，可以将其当做一个近似历史自然实验，通过双重差分的方法考察太平天国战争对人口的净损失。在我们的双重差分模型中，将发生过战争的区域作为实验组，而将未发生战争的地区设定为对照组，然后通过比较战争前后战争区域与非战争区域内人口数量变化进而揭示太平天国战争对人口的净影响。实证模型设定如下：

$$\Delta p_{it} = \alpha + \beta_1 region_i + \sum_{t=n-1}^{n} \beta_t war_t + \sum_{t=n-1}^{n} \delta_t (region_i \cdot war_t) + \gamma X + \varepsilon_{it} \quad \cdots\cdots (1)$$

其中，Δp_{it} 表示第 i 个地区在时间 t 期内的人口变化；$region_i$ 为地区虚拟变量，衡量第 i 个地区是否是太平天国战争区域，如果地区 i 是主要战争区域 $region_i$ 为 1，否则为 0；war_t 为时间虚拟变量用来区别在 t 时期内是否为战争时期，如果是太平天国战争时期（即 1851 年至 1864 年）war_t 等于 1，其他时期 war_t 等于 0；$region_i \square war_t$ 为地区虚拟变量与是时间虚拟变量的交互项，其系数 δ 为双重差分估计系数，用以识别太平天国战争对人口损失的净影响；X 为一系列与人口数量相关的控制变量，主要包括各地区的地理因素、初始经济状况、旱涝等级等；最后 α, β, γ 为待估计系数，ε 为随机扰动项。

（二）变量选择及数据来源

1、被解释变量

作为模型中重要的被解释变量的人口数据主要来自曹树基（2001）主编的《中国人口史》（第 5 卷）。之所以选择该资料作为近代中国人口数据的来源，不仅是因为其提供了

① 参见《筹赈收复地方并酌情调免漕银片》，《李文忠公全集.奏稿》第 3 卷。

② 参见《沿途察看军情贼片》，《曾文正公全集.奏稿》第 18 卷。

③ 双重差分模型最早被经济学家应用于政府政策制定与评估的研究中，如 Card and Krueger (1994)、Duflo（2001）等，但由于模型设计的优越性也被很多经济史学家用来处理历史当中的历史自然实验问题。如 Acemoglu, Johnson and Robinson (2005)、Acemoglu, Cantoni, Johson and Robinson (2011)、Diamond and Robinson (2010)。

1776、1820、1850、1880、1910 较多观测截面的人口信息，更重要的是在其著作中对中国核心地区府级人口进行了重建，大大修正了已有人口史著作中对人口概念的误解。因此，我们采用该数据构造这些从 1776-1820、1820-1850、1850-1880、1880-1910 四个不同时间段内各自年均人口增长率。[①]此外，由于太平天国战争发生的同时，云南地区发生了彝族起义和回民战争，陕西、甘肃地区则发生了回民战争和光绪大旱灾，而四川、贵州发生了教军、号军及昭通李、蓝起义等，因此，本文的观测对象仅涉及中国核心省份中的 12 个省作为研究样本，共计 175 个府[②]，其地理分布如图 1 所示。

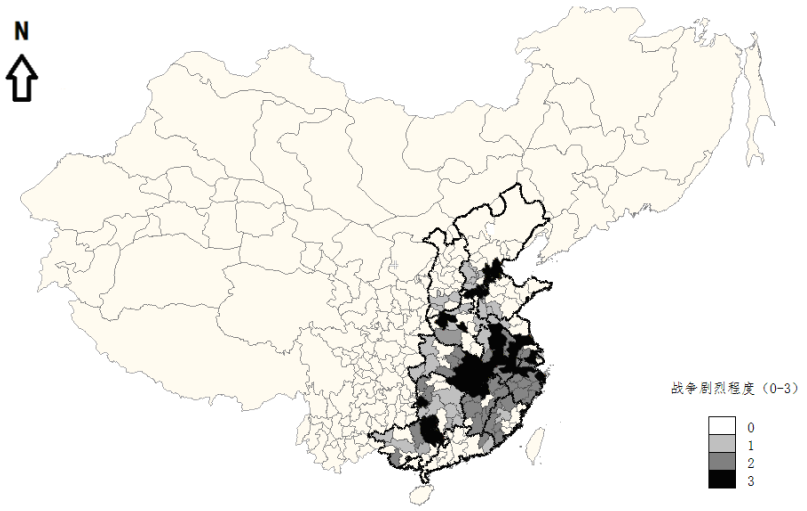

图 1：太平天国活动范围及战争冲突分布情况

注：根据太平天国活动范围及战争信息，将战争剧烈程度分为 4 个等级：0 没有发生战争地区，1 太平军活动地区，2 小规模冲突地区，3 主要战场。

资料来源：根据华强，1991：《太平天国地理志》、郭毅生，1989：《太平天国历史地图集》等信息利用 ArcGis 4.0 绘制。

2、核心解释变量

本文的核心解释变量为双重差分统计量，即是否为战争爆发时期（如果是战争爆发时期=1）时间虚拟变量同是否发生战争地区虚拟变量（发生=1）的交互项。其中太平天国战争爆发时间虚拟变量主要依据从太平天国运动开始至太平天国国都南京城被攻陷进行设定。但由于在我们获得的清代 5 个有效人口截面数据中缺乏 1851 年和 1864 年的数据，因此这里将 1850 至 1880 年时期作为太平天国战争爆发的时间。其中 1850-1880 年设定为太平天国战争爆发时间，其余时间段为非太平天国战争时期。

而战争爆发地区虚拟变量主要是根据太平天国在不同时期的活动地区变化而确定。太平天国不同时期活动地点的信息主要来自《中国近代史稿地图集》（张海鹏，1983）、《太平天国历史地图集》（郭毅生，1989）和《太平天国地理志》（华强，1991）等材料。根据以上历史地图及史料信息依照是否为太平天国战争区域，这里把 175 个府划分为相应的实验组与对照组。其中实验组即受太平天国战争影响的府共计 107 个，约占全部样本的 61%，相应的对照组即未受战争影响的府 68 个，占全部样本的 49%。由于采用双重差分模型的前提条件要求实验组与对照组在受到外生冲击前基本是无差异的，因此图 2 给出了实验组与对照组年均人口变化趋势的描述。从中可以看到在 1850 年太平天国战争爆发前，实验组与

① 人口年均增长率计算采用几何平均数计算得出，例如计算 1880-1910 的人口年均增长率计算公式为：$p_{1880-1910}=(p_{1910}/p_{1880})^{1/30}-1$，其中 p_{1910} 和 p_{1880} 分别为 1910 年和 1880 年的人口数量。

② 12 个省分别是直隶、山西、山东、河南、安徽、江苏、江西、浙江、湖北、湖南、广东、广西，共计 177 个府。但由于太平天国战争都是发生在中国大陆地区，所以除去广东省的琼州府（现海南岛）和福建省的台湾府（现台湾岛），故每个时期共有 175 个府作为本文考察的样本。

对照组人口年均增长率分别为 4‰左右，无显著差异。然而在太平天国战争爆发时期，实验组年均人口增长率为-12‰，而对照组年均人口增长率为-2‰。在太平天国战争结束后，实验组与参照组年均人口增长率又恢复到无差异的水平。

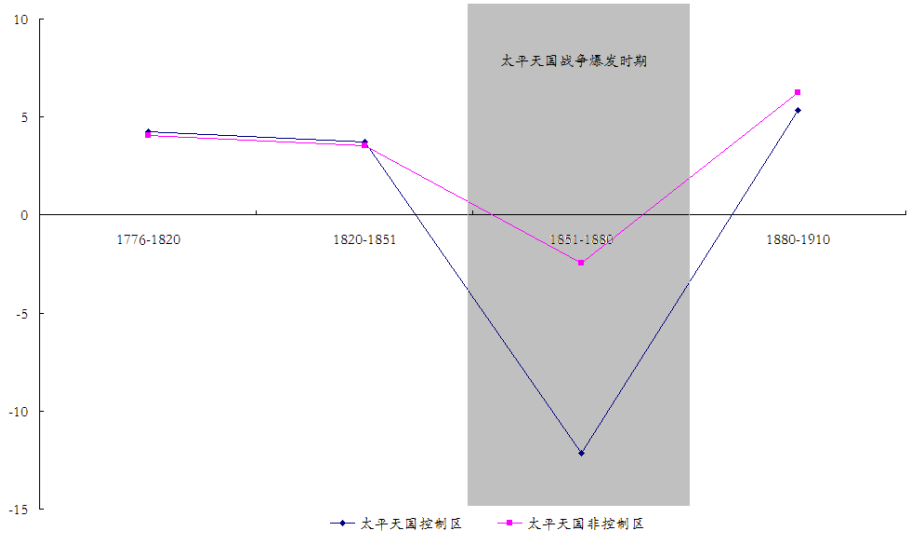

图2：1776-1910年太平天国控制区与非控制区人口增长率（‰）变化趋势

资料来源：根据附表2绘制。

3、主要控制变量

为更好的考察太平天国战争对各府人口损失的估算，一系列与人口增长有关的控制变量加入到模型中以防止遗漏变量对最终估计结果的影响。

首先，地区间经济发展水平差异是造成各地区人口数量差异的主要因素。但由于在近代社会没有体现地区经济发展水平如人均 GDP 的数据，但 Acemoglu, et al. (2002)认为在近代社会由于人口密度同经济发展具有高度的相关性，故可以采用人口密度作为经济发展水平的代理变量。因此，本文采用 1776 年的各府人口密度作为各地区初始经济水平的代理变量用以控制地区间初始经济状况差异对人口数量的影响，数据来源曹树基（2000）主编的《中国人口史》（第 5 卷）。

其次，地理因素的差异也是影响人口数量的重要因素，因此各府与通商口岸的距离、是否为沿海地区（是=1）、与各地督抚所在地的距离、海拔高度等均作为地理因素控制变量加入模型中。其中通商口岸数据主要来源于严中平（1955）主编的《中国近代经济史统计资料选辑》，而督抚所在地、是否为沿海地区等的地理信息来源于《清史稿.地理志》。根据这些历史地理信息采用 CHGIS V4.0 最终获得给自的欧几里德距离。而各地的海拔高度则主要通过 Google earth 7.0 获得。

另外，除了以上经济、地理因素影响人口增长外，自然灾害也是影响人口增长的重要变量，因此本文也对对不同地区的旱涝灾害进行控制，数据主要来自中央气象局气象科学研究院（1981）主编的《中国近五百年旱涝分布图集》。

最后，由于我们的样本数据缺少 1864 年太平天国结束时期的各地方的人口信息，进而采用 1880 年的人口进行近似度量，这样可能会在回归结果中造成统计偏差。特别是在 1864 年至 1880 年间，中国大地上也发生了其他对人口有重大影响的历史事件。比如太平天国战争结束后，由于江南地区人口损失严重，进而出现众多人口迁移江南地区。移民的产生将会对以上地区人口数量产生低估的可能。此外，在 1850 年至 1880 年内发生的其他战争（如捻军起义、第二次鸦片战争等）与光绪初年大旱灾所导致的人口死亡会被重复计算在太平天国战争对人口的影响中，从而形成高估。[①]因此，为克服以上数据缺陷，我们进而将是否为光绪大旱灾受灾地区（是=1）、是否为太平天国战后移民移入地（是=1）以及

① 如在光绪初年间（1876-1880 年）在中国华北的主要地区如山西、河南、河北、山东等地出现了大旱灾进而导致大量人口死亡（何汉威，1980）。

在太平天国战争时期该地区是否有其他战争发生（有=1）等作为控制变量加入到模型中以消除数据缺陷所带来的估计影响。所有主要变量统计描述在表 1 给出。

表 1：主要变量统计描述

变量名称		观察值	均值	标准差	最小值	最大值
人口数量（万）	1776 年	175	142.17	109.54	4.4	529.2
	1820 年	175	175.58	137.72	5.9	682.08
	1851 年	175	193.89	151.7	6.69	798.03
	1880 年	175	157.7	133.22	5.3	684.57
	1910 年	175	181.48	147.99	8.1	757.58
是否太平天国控制区（是=1）		700	0.61	0.49	0	1
太平天国控制持续时间（月）		700	9.65	21.36	0	136
太平天国战争剧烈程度（0-2）		700	1.18	1.11	0	3
各府与南京城的距离（公里）		700	9.56	17.77	0	123.08
各府与最近通商口岸的距离（公里）		700	5.85	3.83	0.14	21.97
是否为沿海地区（是=1）		700	0.18	0.38	0	1
各府与本省督（抚）衙门的距离（公里）		700	2.86	9.13	0	118.68
是否为捻军活动区（是=1）		700	0.05	0.23	0	1
是否为天地会起义活动区（是=1）		700	0.04	0.2	0	1
是否为白莲教起义活动区（是=1）		700	0.01	0.12	0	1
是否为幅军起义活动区（是=1）		700	0.01	0.08	0	1
各府地理海拔高度（千米）		700	0.24	0.35	0	1.35
1776 年人口密度（人/平方公里）		700	142.80	108.82	5.01	529.20
受灾程度（0-2）		700	0.73	0.66	0	2
是否光绪旱灾灾区（是=1）		700	0.05	0.22	0	1
太平天国战争后是否为移民区（是=1）		700	0.08	0.25	0	1

数据来源：1. 人口数量和1776年人口密度的数据根据曹树基（2001）整理得出；2. 是否战争区（是=1）、持续时间（月）和战争剧烈程度（0-3）的数据来源于《太平天国史》、《中国历代战争史》（第18册）和《太平天国地理志》；3.与南京的距离（公里）、是否沿海地区（是=1）和与督抚距离（公里）的数据来源于《太平天国历史地图集》、《中国历史地图集》结合ArcGis 4.0计算得到；4.是否为捻军、天地会起义、白莲教起义和幅军起义活动区的数据来自《中国近代史稿地图集》；5.海拔高度（公里）根据Google earth 7.0得出；6.受灾程度（0-2）的数据根据《中国近五百年旱涝分布图集》整理得出。在该图集中，自然灾害被分为被分为1-5个数值。其中数值3为正常，小于3为水灾，而大于3为旱灾，离3的距离越远表明受灾害的程度越严重。在本研究中灾害种类并不重要，但其灾害的程度相对来说比较重要，因此构建灾害程度指数，具体计算公式为：受灾程度指数=$|disaster_t-3|$。其含义是如果数值离中值3越大，则表明灾害程度越大，越小则表明灾害程度越小；7.是否光绪旱灾灾区（是=1）的数据来源于《中国灾害通史》（清代卷）；8.是否有移民移入（是=1）的数据来源于曹树基（1997）所著的《中国移民史》（第6卷）。

（三）实证策略

尽管本研究采用了双重差分模型而且控制了其他一系列影响人口数量的因素，但是这仍不足以让我们相信所得到的估计结果不会受到其他诸如度量误差、缺失变量以及反向因果关系所导致的内生性问题的影响。因此，在这一部分本研究的实证策略将进一步讨论。

首先，针对潜在的由缺失变量、度量误差及反向因果关系所形成的内生性度量误差问题，我们将采用工具变量法对进行修正。一个好的工具变量要求其与随机干扰项无关，而与内生变量相关。而在本研究中内生变量为该地区是否受太平天国战争影响的地区，因此需要找到一个工具变量与是否为太平天国战争区域虚拟变量有较强的相关关系，但与人口年均增长率无关。

由于太平天国力量非常强大，清政府为剿灭太平天国动用了较多资源，特别是为了遏制太平天国发展，清政府在南京附近分别设立江南大营（南京）和江北大营（扬州）。所以越是靠近南京的地区，越是太平军和清军的战斗争夺最为激烈的地方，但是各个府到江南和江北大营的空间地理距离与各地区人口年均增长率无直接关系。因此，这允许我们采用各个府到南京城的距离作为工具变量，识别太平天国战争对各地区人口变化影响。带有工具变量的两阶段回归方程设定如下：

$$\Delta p_t = \alpha + \beta_1 \hat{region}_i + \sum_{t=2}^{4} \beta_t d_t + \sum_{t=2}^{4} \delta_t (\hat{region}_i \cdot d_t) + \gamma X + \varepsilon_{it} \quad ... (2)$$

$$\hat{region}_i = \alpha_0 + \alpha_1 dis\_nanjing_i + \alpha_2 X + \nu_i \quad ... (3)$$

其中，方程（3）为第一阶段回归，被解释变量为内生变量，即是否为发生战争的府，工具变量 $dis\_nanjing_i$ 为第 i 个府至南京城的欧几里得地理距离。而方程（2）为第二阶段回归，这里被解释变量同方程（1）为 Δp_{it}，表示第 i 个地区在时间 t 期内的年均人口增长率；而 $\hat{region}_i$ 为通过第一阶段回归得到的 $region_i$ 估计值；war_t 为时间虚拟变量用来区别在 t 时期内是否为战争时期，如果是战争时期等于 1，其他时期为 0；$\hat{region}_i \square war_t$ 为是否战争区域在第一阶段回归的估计值与是否是战时虚拟变量的交互项，其系数 δ 为双重差分估计系数，用以识别太平天国战争对人口损失的净影响；X 为一组控制变量，主要包括各地区的地理因素、初始经济状况、旱涝等级等；最后 α, β, γ 为待估计系数，ε、ν 为随机扰动项。我们期望通过新的两阶段回归结果可以修正初步回归结果中由内生性估计偏差造成的影响。

其次，存在于解释变量中的度量误差也可能会威胁到最终的估计结果。虽然虚拟变量（是否为太平天国战争地区）较为简单的识别出是否受太平天国影响的地区，但是不能对其影响程度进行区分。因此，根据华强（1991）编著的《太平天国地理志》提供的太平军在某一个地方占领时间长短以及根据中国军事科学院（2003）编著的《中国历代战争年表》获得的不同地区战争激烈程度作为另外两个解释变量的代理变量。其中占领时间主要按照月来进行统计，如南京占领时间为 1853 年 3 月，被清军攻下的时间为 1864 年 7 月，因此被太平军占领时间为 11 年零 4 个月，即 136 个月。而战争剧烈程度由于缺乏每场战斗具体死亡人数的统计，故只能根据是否为主要战场来对战争残酷程度进行判断。这里将战争激烈程度划分为四类：如果不发生战争，战争残酷程度设定为 0；如果仅为太平军活动的地区，战争激烈程度设定为 1；如果太平军与清军发生小规模冲突，此时设定为 2,；如果是主要战场（如南京、苏州、长沙等）设定为 3。[①]本文包含的所有样本战争激烈程度如图 1 所示。

四、实证结果及分析

(一)初步 OLS 回归结果

表 2 给出了采用双重差分模型的 OLS 回归结果。其中表 2 第 1 列给出了未添加任何控制变量的估计结果。双重差分估计量表明，太平天国战争的确对人口产生了巨大的影响，其中受太平天国战争影响的地区与未受战争影响的地区相比年均人口增长率减少了近 9.8‰。

[①] 前期主要战场有：直隶的天津府、河间府和广平府，山东的东昌府，河南的怀庆府、河南府，安徽的凤阳府，江苏的扬州府，湖北的汉阳府、黄州府，江西的九江府、南昌府和瑞州府，湖南的岳州府、长沙府，广西的桂林府和平乐府。后期主要战场有：安徽的庐州府、安庆府、宁国府和太平府，江西的九江府，江苏的江宁府、苏州府和松江府，以及浙江的杭州府和宁波府。（《中国近代史稿地图集》，P21-22，P41）

为了获得更加稳健的估计结果，在表 2 第 2 列添加了其他对人口数量差异有较强影响的因素作为控制变量，如初始经济发展水平、地理因素（如至通商口岸的距离、距督抚的距离、海拔等）以及水旱灾等。此时，新的估计结果与第 1 列基本一致，双重差分估计量为-10.3‰。

由于本研究所使用的数据缺少 1864 年截面人口信息，而采用 1880 年的人口信息又会导致因受其他诸如太平天国战后移民或同时期爆发战争和瘟疫等因素而产生的高估或低估。因此，在表 2 第 3 列，这里进一步控制了所观测的地区是否为战后移民移入地（是=1）、是否为光绪初年大旱灾爆发地区（是=1）以及在太平天国战争时期是否爆发过其他战争（有=1）等。新的估计结果虽然与前两列的回归结果基本相同，估计结果具有一定的稳健性，但双差分估计系数为-11‰，比前两列有所增加，这一结果表明控制变量对于最终估计结果具有较为显著的影响。

表 2：太平天国战争对人口影响的初步回归结果

被解释变量：	年均人口增长率（‰）		
	(1)	(2)	(3)
双重差分估计量：			
1820-1851×是否为战争区域（是=1）	0.029	-0.285	-0.117
	(0.05)	(-0.43)	(-0.20)
1851-1880×是否为战争区域（是=1）	-9.845***	-10.328***	-11.030***
	(-4.65)	(-4.83)	(-5.47)
1880-1910×是否为战争区域（是=1）	-1.062	-1.521	-1.275
	(-0.76)	(-1.09)	(-1.00)
控制变量：			
Log(1776年人口密度)(人/平方公里)		-0.940	-1.028
		(-1.61)	(-1.89)
log（至最近的通商口岸）(公里)		0.125	0.265
		(0.18)	(0.39)
是否沿海（是=1）		1.342	2.188
		(1.01)	(1.79)
log（至督抚距离）(公里)		0.499	0.747
		(0.82)	(1.33)
log（海拔）(千米)		-0.269	-0.177
		(-0.75)	(-0.53)
受灾程度（0-2）		-0.857	-0.398
		(-1.62)	(-0.83)
是否发生捻军战争（是=1）			8.932***
			(3.64)
是否发生天地会起义（是=1）			11.439***
			(5.32)
是否发生白莲教起义（是=1）			11.389***
			(3.32)
是否发生幅军起义（是=1）			-0.186
			(-0.04)
是否发生旱灾（是=1）			-8.305**
			(-3.03)
是否有移民移入（是=1）			2.818
			(1.97)
常数项	1.185	6.493	4.737
	(0.53)	(1.51)	(1.14)

观察值	700	700	700
R-squared	0.389	0.397	0.479
F-统计量	12.047	9.300	9.739

注：1.所有回归均控制了时间和地区的固定效应，但由于空间有限未给出结果。2.括号中为 t-值统计量。3.***p<0.01，**p<0.05，*p<0.1。

（二）稳健性检验

由于表 2 中构建的双重差分估计量采用地区虚拟变量作为太平天国战争影响的代理变量过于宽泛，未能对战争影响程度进行衡量。因此，采用太平天国政权控制时间以及战争激烈程度作为代理变量的估计结果在表 3 给出。

表 3 第 1 列和第 2 列报告了以太平天国政权控制持续时间作为核心解释变量未加入与加入控制变量的估计结果。我们发现新的回归结果同表 2 相比明显增大，估计结果暗示采用地区虚拟变量来识别太平天国战争对人口的影响的确存在度量误差。而且从新的回归结果可以看到，随着太平天国政权控制时间的不断延长，对人口的影响也不断增强，即太平天国战争持续时间每增加 1 个百分点，受战争影响的区域比非战争区域的年均人口增长率减少约 25‰（表 3 第 2 列）。

在接下来的第 3 和第 4 列给出了利用太平天国时期战争强度作为代理变量考察太平天国战争对人口影响的估计结果。从回归的结果可以看到与表 3 前两列估计结果类似，即战争发生越是激烈的地区，对人口的影响也越严重。其中战争剧烈程度每增加 1 个单位，战争区域比非战争区域的人口平均少了约 19‰的人口增长。

表 3：太平天国对人口影响的稳健性检验：战争持续时间和剧烈程度为代理变量

被解释变量：	年均人口增长率（‰）			
	(1)	(2)	(3)	(4)
核心解释变量：				
1820-1851×战争持续时间（log）	-0.233	-0.133		
	(-0.71)	(-0.21)		
1851-1880×战争持续时间（log）	-16.243***	-25.261***		
	(-8.41)	(-7.43)		
1880-1910×战争持续时间（log）	0.617	1.592		
	(0.62)	(0.86)		
1820-1851×战争剧烈程度			-0.010	-0.366
			(-0.05)	(-0.51)
1851-1880×战争剧烈程度			-5.603***	-19.282***
			(-5.05)	(-5.63)
1880-1910×战争剧烈程度			-0.411	0.964
			(-0.84)	(0.59)
控制变量：				
初始经济状况、地理因素等。	No	Yes	No	Yes
观察值	700	700	700	700
R-squared	0.511	0.628	0.366	0.045
F-统计量	30.511	14.427	20.358	7.494

注：1.控制变量包括：初始经济状况、地理因素、旱涝等级、是否有其他战争、是否发生旱灾和是否有移

民移入。其中，初始经济状况以 1776 年人口密度（log）衡量。地理因素包括与通商口岸的距离、是否沿海、与督抚的距离、海拔高度。其他战争包括在太平天国期间的捻军起义、天地会起义、白莲教起义和幅军起义。旱灾指光绪初年的华北地区旱灾。2.所有回归均控制了时间和地区的固定效应，但由于空间有限未给出结果。3.括号中为 t-值统计量。4.***p<0.01，**p<0.05，*p<0.1。

（三）工具变量回归结果：2SLS

尽管在以上分析中我们对太平天国战争与近代人口之间的关系进行了初步讨论和稳健性检验，讨论了解释变量中存在的度量误差对回归结果产生的影响。但这些结果依然受到诸如缺失变量所导致的内生性估计偏差的困扰。因此，在最后我们给出了采用各个府至南京城地理距离作为工具变量的两阶段回归结果。

表 4 报告了带有工具变量并采用地区虚拟变量来识别太平天国战争对人口影响的两阶段估计结果。从表 4 中发现双重差分估计量与先前未采用工具变量得到估计结果（表 2 第 1 列和第 3 列）存在偏差，估计系数有所增大。这表明我们的 OLS 估计结果受由于缺失变量所导致的内生性问题的影响，OLS 的估计结果被低估。双重差分估计量系数表明，在加入工具变量剔除缺失变量影响后，受太平天国战争影响地区与未受战争影响地区相比年均人口增长率减少了近 33‰。此外，通过给出的 Dubin-Wu-Hausman 检验结果，其统计量显著水平分别小于 1%和 10%，这表明原方程存在内生性估计偏差，带有工具变量进行两阶段回归的结果更加可信。

表 4：到南京城的距离（log）作为工具变量的回归结果

被解释变量：	年均人口增长率（‰）	
	(1)	(2)
核心解释变量：		
1820-1851×是否为战争区域（是=1）	0.261	-1.504
	(0.23)	(-0.74)
1851-1880×是否为战争区域（是=1）	-33.511***	-33.619***
	(-3.90)	(-3.73)
1880-1910×是否为战争区域（是=1）	2.426	-0.096
	(0.62)	(-0.02)
控制变量：		
初始经济状况、地理因素等。	No	Yes
观察值	700	700
R-squared	0.039	0.108
F-统计量	14.846	9.531

注：1.控制变量包括：初始经济状况、地理因素、旱涝等级、是否有其他战争、是否发生旱灾和是否有移民移入。其中，初始经济状况以 1776 年人口密度（log）衡量。地理因素包括与通商口岸的距离、是否沿海、与督抚的距离、海拔高度。其他战争包括在太平天国期间的捻军起义、天地会起义、白莲教起义和幅军起义。旱灾指光绪初年的华北地区旱灾。2.所有回归均控制了时间和地区的固定效应，但由于空间有限未给出结果。3.Durbin-Wu-Hausman 检验的结果 p 值分别为 0.0002 和 0.0976。4.括号中为 t-值统计量。5.***p<0.01，**p<0.05，*p<0.1。

类似地，为了得到更加稳健的估计结果，剔除地区虚拟变量中度量误差的影响，在表 5 给出了分别采用战争持续时间、战争激烈程度作为解释变量的两阶段回归结果。从最终回归结果可以看到，采用工具变量后，新的回归结果（表 5 第 2 和第 4 列）与先前回归结果（表 3 第 2 列和第 4 列）基本一致。类似表 4 的实证策略，这里也给出了 Dubin-Wu-Hausman 检验结果。尽管发现 OLS 和 IV 回归结果基本一致，这表明原有通过 OLS 获得的估计结果未受较多缺失变量的影响，但是 Hausman 的检验结果均统计显著，因此带有工具变量的两阶段估计结果更加可靠。

表 5：以持续时间和战争剧烈程度为代理变量的工具变量回归的稳定性检验

被解释变量：	年均人口增长率（‰）			
	(1)	(2)	(3)	(4)
核心解释变量：				
1820-1851×log（持续时间）	0.132	-0.069		
	(0.23)	(-0.09)		
1851-1880×log（持续时间）	-16.978***	-24.582***		
	(-5.39)	(-7.02)		
1880-1910×log（持续时间）	1.229	0.941		
	(0.63)	(0.47)		
1820-1851×战争剧烈程度			0.106	-0.359
			(0.23)	(-0.45)
1851-1880×战争剧烈程度			-13.533***	-18.684***
			(-4.33)	(-4.60)
1880-1910×战争剧烈程度			0.980	0.316
			(0.61)	(0.18)
控制变量：				
初始经济状况、地理因素等。	No	Yes	No	Yes
观察值	700	700	700	700
R-squared	0.510	0.623	0.192	0.103
F-统计量	26.596	18.543	16.893	8.738

注：1.控制变量包括：初始经济状况、地理因素、旱涝等级、是否有其他战争、是否发生旱灾和是否有移民移入。其中，初始经济状况以 1776 年人口密度（log）衡量。地理因素包括与通商口岸的距离、是否沿海、与督抚的距离、海拔高度。其他战争包括在太平天国期间的捻军起义、天地会起义、白莲教起义和幅军起义。旱灾指光绪初年的华北地区旱灾。2.所有回归均控制了时间和地区的固定效应，但由于空间有限未给出结果。3. Durbin-Wu-Hausman 检验的结果 p 值分别为 0.0013、0.0000、0.0003 和 0.0478。4.括号中为 t-值统计量。5.***p<0.01，**p<0.05，*p<0.1。

五、太平天国战争造成的人口损失究竟有多大？

19 世纪中叶爆发于中国南方地区的太平天国运动，以其持续时间之长、活动波及范围之广、造成人口损失之多，被诸多学者（如 Ho, 1959；Wakeman, 1997）认为是世界人类历史上最大的杀戮。但究竟这次大的人类灾难对人口损失的影响究竟如何，学界依然处于争

论状态。比如在太平天国战争结束不久，美国传教士 Happer（1880）即根据战争爆发地区的记录与观测对其人口损失进行估计，他认为太平天国战争至少导致约 5000 万人的人口损失。而后来近代学者葛剑雄、侯杨方、张根福（1999）认为这个数字可能被低估，应该至少在 1 亿人左右，超出 Happer 估计数量的一倍以上。因此，在这一部分里，我们对太平天国战争究竟导致多少人死亡这一问题进行进一步的讨论，并对现有估计进行校正。为了达到这一目标，首先根据先前几部分得到的双重差分估计量还原受战争影响地区真是的人口年均增长率，然后根据计算结果结合在太平天国战争前确切人口数据估算实际战争引起的人口净损失。

根据前文利用双重差分模型计算出太平天国战争期间受战争影响与未受战争影响地区之间的年均人口增长率，采用 Wooldridge (2006)提供的分解双重差分估计量的方法进而对战争期间人口损失进行估计。双重差分估计量分解式如下：

$$\delta_{1850\text{-}1880,war=1}=(p_{1850-1880,war=1}-p_{1850-1880,war=0})-(p_{1776\text{-}1820,war=1}-p_{1776\text{-}1820,war=0})\text{.....（4）}$$

其中，$\delta_{1850\text{-}1880,war=1}$ 为太平天国战争爆发时期战争地区的双重差分估计量，度量在战争爆发前后，战争区域与非战争区域人口的净损失；$p_{1850-1880,war=1}$ 和 $p_{1850-1880,war=0}$ 分别为太平天国战争爆发时战争区域和非战争区域的年均人口增长率；而 $p_{1776-1820,war=1}$ 和 $p_{1776-1820,war=0}$ 则为在本研究中基本对照时间太平天国战争前战争区域和非战争区域的年均人口增长率。

首先，从第四部分表 4 和表 5 中，分别获得了通过地区虚拟变量、太平天国政权持续时间以及战争强度度量构建的反映太平天国战争对人口净影响的双重差分估计量（-33.6‰、-24.6‰、-18.6‰）。然后，通过曹树基（2001）提供的府级人口数据分别得到 $p_{1850-1880,war=0}$、$p_{1776-1820,war=1}$ 和 $p_{1776-1820,war=0}$ 各时间段的年均人口增长率（分别为-2.47‰、4.23‰和 4.07‰）。接下来可以根据公式（4）结合以上数据，分别计算太平天国战争爆发时发生战争的地区年均人口增长率的估计值 $\hat{p}_{1850-1880,war=1}$。其中采用地区虚拟变量构建双重差分估计量获得的实验组战争时期年均人口增长率为-35.9‰，而采用太平天国政权持续时间和战争强度测算的结果分别为-26.9‰和-20.9‰。①

表 6：历来对太平天国造成的人口损失的估计

研究学者	范围	死亡人数（万人）	资料来源
曹树基（2001）	江苏、浙江、安徽、福建、湖南、湖北和江西等 7 省	7330	《中国人口史》（第 5 卷）
陈恭禄（1953）	全国	10000	《中国近代史》
路遇和滕泽之（2000）	全国	7500 以上	《中国人口通史》
葛剑雄等（1999）	全国	10000	《人口与中国的现代：1850 年以来》
	湖北、浙江、江苏、安徽、江西等 5 省	5400 以上	
Happer（1880）	全国	8300	*A letter to prof. F. Max Muller on the sacred books of China*
Ho（1959）	全国	10000 以上	*Studies on the Population of China, 1368–1953*
Perkins（1969）	湖北、浙江、江苏、安徽、江西等 5 省	4000 以上	*Agricultural Development in China 1368-1968*

① 如计算利用地区虚拟变量测算的实验组战时年均人口增长率为：(4.23‰-4.07‰)-2.47‰-33.6‰=-35.9‰，其他计算过程略。

李楠、林矗（2013）	全国		5819~9168	本文

接下来我们可以根据所获得的战争爆发地区在战争时期年均人口增长率计算人口净损失。在我们的样本中 13 个省共有 107 个府在太平天国战争时期受到战争影响，这些府战前（1851 年）人口为 24235 万人（曹树基，2001），因此至战争结束 1864 年为止，根据前文得到的战时战区年均人口增长率进而可以推算太平天国战争所带来的人口损失约为 5819 万至 9168 万。[①]通过同以往研究对比发现（见表 6），我们的估计结果恰好包含在现有历史人口学家对太平天国战争人口影响的估计区间之内。其中太平天国战争造成的死亡人数最多不会超过 1 亿人，尽管针对陈恭禄（1935）、Ho（1959）、葛剑雄等（1999）均有超过 1 亿人的死亡人数估计，但这些估计结果均加上了其他导致人口死亡的原因，如回民起义、华北大旱灾等造成的死亡。而对于战争发生剧烈的江苏、浙江、安徽、福建、湖南、湖北和江西 7 省，战前战区人口为 18084 万人，以同样方法结算可得损失人口 4342 至 6841 万人。通过比较发现，现有学者对此估计略显过高，如曹树基（2001）对于七省的估计 7330 万人过高，实际死亡人数未必有如此之巨。此外，针对 Perkins（1969）、葛剑雄等（1999）等对湖北、浙江、江苏、安徽、江西等 5 省的估计，我们也进行了相应的测算，发现在这 5 省中人口损失约 3899 万至 6690 万人，Perkins（1969）与葛剑雄等（1999）存在低估。通过以上估计结果我们发现，总体上现有研究对于太平天国战争对人口损失的影响较为一致，但对于全国范围来看，由于现有研究难以区分其他因素诸如回民起义、湖北旱灾、捻军起义等对人口的影响，存在高估的可能，而对于核心区域的人口估计则存在一定的低估。而本文通过构建双重差分模型对太平天国战争对人口净影响的估计恰恰对以上两个误差进行了修正。

六、结论

战争对人口的影响，作为马尔萨斯论述东方社会现实性预防人口特征的重要内容，倍受历史学家、人口学家的关注。而作为近代中国历史上规模最大、破坏最为严重的太平天国战争，其对近代人口的影响却一直讨论的重要内容。争论的关键则存在于两方面的不足：一是数据质量的局限，即缺乏可以构建微观人口特征的数据；二是研究方法的不足，缺乏对战争与人口之间因果关系的考察，并且对太平天国战争对人口的净影响进行识别的方法。针对前者，曹树基（2001）提供了较为系统化的清代府级人口数据，解决了缺乏详实可信数据的问题。但对于后者，时至今日依然没有合适的方法讨论太平天国战争对人口净影响。因此，本文利用已有的 5 个截面的分府人口数据，通过构建双重差分模型，考察在战争前后不同地区太平天国战争对战争前后人口变化的影响。

本文发现发生太平天国战争对近代中国人口变化具有显著的影响，太平天国战争爆发时战争发生区域与未受战争影响的区域具有明显的差异，特别是在战争爆发之后长时间里，即使在加入了初始经济状况、地理条件、自然灾害等因素后，战争区域比非战争区域年均人口增长率减少 33‰。而该结果在采用了战争持续时间和战争剧烈程度作为是否战争发生区的代理变量之后，战争区域比非战争区域人口年均增长率减少 25‰和 18‰。

根据以上计算的年均增长率我们分别计算了太平天国主要活动地区的人口损失，研究结果发现，全国范围太平天国造成的人口净损失在 5819 万至 9168 万之间。虽然该估计依然在传统历史学家、人口史学家的估计范围内，但对比发现现有关于太平天国战争对人口影响的研究存在较明显的高估。此外，通过本文的分析，不仅揭示了太平天国战争所造成的巨

① 太平天国战争对人口损失的影响为 $p_{1851}-p_{1864}$。这里 1864 年人口为：$p_{1864}=p_{1851}\cdot(1+r)^{(1864-1851)}$，其中 r 为年均人口增长率。根据此计算公式以及依据地区虚拟变量、太平天国政权持续时间、战争程度获得不同年均人口增长率，最终根据不同标准估算人口损失分别为：9168 万人（地区虚拟变量）、7233 万人（太平天国政权持续时间）、5819 万人（战争剧烈程度）。

大人口损失，同时人口的大量损失也为理解近代江南经济快速发展以及为何近代江南存在普遍低生育率提供了间接的证据。

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附录：

附表1：实验组和对照组的统计比较

		实验组（发生战争区域）	对照组（不发生战争区域）
年均人口增长率（‰）	1776-1820	4.23 （1.21）	4.07 （2.28）
	1820-1851	3.73 （2.16）	3.54 (2.23)
	1851-1880	-12.16 （17.13）	-2.47 (12.92)
	1880-1910	5.35 (5.30)	6.26 (8.97)
是否太平天国控制区（是=1）		1 （0）	0 （0）
各府与最近通商口岸的距离（公里）		5.17 （3.42）	6.91 （4.25）
是否沿海（是=1）		0.13 （0.34）	0.25 （0.44）
各府与督（抚）衙门的距离（公里）		2.20 （2.64）	3.95 （14.5）
各府的海拔高度（千米）		0.14 （0.22）	0.39 （0.46）
府的数量		107	68

资料来源: 年均人口增长率的数据来自《中国人口史》(第 5 卷); 其他变量来源同表 2。

注：括号内数字为标准差。

附录 2：工具变量与内生变量第一阶段的回归结果

被解释变量：	是否战争区（是	log（持续时间）	战争剧烈程度
	(1)	(2)	(3)
核心解释变量：			
log（至南京城的距离）	-0.190***	-0.429***	-0.422***
	(-6.53)	(-10.32)	(-6.36)
控制变量：			
初始经济状况、地理因素等。	Yes	Yes	Yes
观察值	700	700	700
R-squared	0.328	0.489	0.357
F-统计量	59.136	66.244	67.450

注：1.控制变量包括：初始经济状况、地理因素、旱涝等级、是否有其他战争、是否发生旱灾和是否有移民移入。其中，初始经济状况以 1776 年人口密度（log）衡量。地理因素包括与通商口岸的距离、是否沿海、与督抚的距离、海拔高度。其他战争包括在太平天国期间的捻军起义、天地会起义、白莲教起义和幅军起义。旱灾指光绪初年的华北地区旱灾。2.两个工具变量皆与是否战争区、持续时间和战争剧烈程度呈显著负相关。3.所有回归均控制了时间和地区的固定效应，但由于空间有限未给出结果。4.括号中为 t-值统计量。5.***p<0.01，**p<0.05，*p<0.1。

A Re-estimation of the Effect of the Taiping Rebellion on Population Loss in Modern China: An Empirical Analysis Based on Historical Natural Experiment

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Abstract： The effect of the Taiping Rebellion on population loss in modern China has been a subject of ferocious debate. Using a unique prefectural panel data on population during Qing dynasty, this paper employs difference-in-differences and instrumental variable approaches to re-estimate the causal relationship between the Taiping Rebellion and population loss in modern China. We find that the prefectures which are occupied by Taiping troops have lower around 25‰ average annual population growth rate than those which failed to be occupied. This finding not only revises the existing estimates on the effect of Taiping Rebellion on population loss, but also enriches the relevant discussion on whether there is Malthusian trap in the 19th century China or not.

Key words： War, Taiping Rebellion, Population loss

JEL Classification：J01, N35, N45,

Silver Fetters? The Rise and Fall of the Chinese Price Level 1928-34

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Abstract

We show how the silver standard transmitted world silver price fluctuations into China and made the Chinese price level closely linked to the world silver price. Inflation was transmitted between 1929 and 1931 when the world silver price was falling; while deflation was transmitted during 1932 and 1934 when the world silver price was rising. Using micro-level evidence and counterfactual simulations, we show that the exchange rate was the main shock transmission channel, and silver stocks played an insignificant role.

JEL Codes: C32, E32, N15

Key Words: silver standard, Chinese economy, structural VAR, counterfactual response

1 Introduction

Silver was the basis of China's monetary system until November 1935. Although internally China made much use of copper currency, it was practically on a silver standard vis-`a-vis foreign trade. In this paper, we address two questions essential to the Chinese silver standard. First, was the silver standard responsible for the observed strong linkage between the silver price and the Chinese price level?

Second, if the silver standard was indeed the answer for the first question, what were the transmission mechanisms? To answer these questions, we employ a structural VAR model that is flexible in accommodating the time-series properties of the data and at the same time allows for a structural interpretation of the results. The data we use is from 1928 to 1934, a period during which high-quality monthly data are available. We use counterfactual simulations based on the structural VAR as our main analytical tools.

The empirical contributions of this paper are twofold. First, we show that being on a silver standard, shocks to the world silver price were transmitted into commodity prices, making the Chinese price level linked to the world silver price. Second, we show that the exchange rate was the main channel through which the world silver price affected the Chinese price level. We provide micro-level evidence, including price indices of exports, imports, and commodities making up the price indices, that supports the above findings.

China was vulnerable to influences of the world silver price due to a combination of two factors. On the one hand, silver was traded internationally and its price was determined by various factors irrespective of the Chinese economy. China and India were the most important purchasers of silver. Chinese demand for silver influenced the London, New York, and Bombay markets, but other factors driving changes in demand and supply of silver were also present and were beyond China's control (Shiroyama, 2008, p. 31). On the other hand, the arbitrage mechanism had made pre-1945 China financially integrated with the world economy, and the exchange rate of the Chinese currency was tied to global silver prices (Ho et al., 2013).

This strong linkage between the world silver price and internal price levels was not specific to China. Bojanic (2010) documents that for India in 1886-1893 and for Mexico in 1886-1905,

when both countries were on the silver standard, the fall of silver price (and thus the depreciation of the rupee and peso, respectively) translated into higher internal prices. The point is, countries adopting the silver standard fixed the values of their currencies to silver at the cost of internal price stability.[①]

Given that the gold standard was the prevailing international monetary system before the mid-1930s, the Chinese economy was equivalent to a floating exchange rate regime with respect to gold-standard countries. Therefore, it is not surprising that the literature has emphasized this floating aspect of the Chinese currency, and one example is the argument that being on the silver standard insulated China from the Great Depression (Friedman, 1992; Lai and Gau, 2003). However, this view is only one side of the story because it ignores the simple fact that the silver standard, like the gold standard, is a strict form of fixed exchange rate. The silver standard, in fact, shares many properties of a fixed exchange rate regime.

In this paper we show how the silver standard transmitted external disturbances into China, as a fixed exchange rate would. In the Chinese context, the external shocks were fluctuations of the white metal's price.

How was the Chinese price level linked to silver price? By definition, the price of silver was fixed in terms of Chinese currency under the silver standard. Prices of commodities fell as a direct consequence of the revaluation of the Chinese currency. Moreover, being a price-taker for both export and import commodities, changes in the silver exchange rate were quickly transmitted into China's commodity prices.

Although largely overlooked by contemporaries and subsequent authors, the fact that silver standard could transmit shocks into China did not go unnoticed by critical observers. Commenting on the drainage of silver from China induced by rising world silver price in 1934, a contemporary expressed the concern that "It would indeed be a disaster of the first magnitude if her new-born attempt to establish her currency on a sound footing were to be frustrated by circumstances beyond her control" (Leavens, 1939, p. 296). Chang Su-min, an economist with a Ph.D. from the University of Pennsylvania, who urged the Chinese government to abandon the silver standard, described the downside of the silver standard most clearly:

"China is the only country in the world that remains on the silver standard. Silver is a commodity in other countries but is a currency in China. The Chinese price level is strongly affected by the ups and downs in world silver prices. Both deflation and inflation are determined by non-Chinese factors. While the Chinese economy benefits from inflation, it suffers from deflation. This uncontrollable deflation and inflation is the fundamental drawback of the Chinese silver standard that shall dig its own grave" (Chang, 1935, p. 19).

The same concern finally led the Chinese government to establish a fiat money whose convertibility was no longer tied to silver but instead to the U.S. dollar and British pound at managed exchange rates. As pointed out by Kia-ngau Chang, the then Deputy Governor of the Central Bank of China, "the main object of the currency reform of 1935 was to break the link between internal price levels and silver" (Chang, 1958, p. 11).

It should be noticed that the price data we employed are specific to Shanghai and Tientsin, two important trade port cities, and may not give an accurate description of what was happening on the interior China. It would be interesting to examine whether the same observation also applied to other interior cities such as Chengdu and Chongqing and areas under foreign rule such as Hong Kong and Manchuria. We hope that data availability in the future would enable us to explore this issue.

The rest of the paper is structured as follows. Section 2 begins with the historical context of the Chinese silver standard, followed by a discussion of the transmission mechanisms through which international silver price affects the Chinese economy. Section 3 presents our methodology. Section 4 provides descriptive statistics. Section 5 reports the main empirical results, followed by tests of robustness in section 6. The final section concludes.

[①] John Maynard Keynes highlighted the conflict between stable exchange rates and stable internal prices in A Tract on Monetary Reform (1923). Even though Keynes was referring to the gold standard, his argument in regard to the trade-off between the internal and external stability of a currency also applies to the silver standard, a fixed exchange rate regime like the gold standard.

2 How the world silver price affected the Chinese economy

2.1 The Chinese silver standard

Silver was the basis of the Chinese monetary system from as early as the thirteenth century until the currency reform of November 1935. Silver and copper cash circulated in parallel and served different purposes. While wholesale commerce, long-distance trade and business involving large sums of money were conducted upon a silver basis, copper cash was used in daily transactions and for the payment of wages. From the analytical point of view, it was a metallic system with free and unlimited coinage of silver. Silver coins were mostly imported, and in 1890 Zhang Zhidong created the first Chinese-minted silver dollars at Canton. But it was not until 1914 of the early Republic that the government succeed in establishing national silver coins. In contrast, coinage of copper cash was an exclusive right of the government. The national silver coins quickly replaced the imported silver coins, and by 1920 imported silver coins had been completely driven out of circulation. The Chinese dollar was fixed to silver. Until December 1932, the value of one ounce silver was constantly fixed at 1.268157 Chinese dollars. Realignment occurred in April 1933 and a new parity of 1.323921 was effective until November 1935. During the transition period between January 1933 and March 1933, the parity was kept at 1.294762.

China's silver-copper cash system was, however, not bimetallism in the sense of the nineteenth century gold-silver bimetallism because the exchange rate between silver and copper cash was not fixed but fluctuated constantly according to the market conditions.[①] The standard and weight of silver were managed by private melting shops and the privately sponsored Public Assay Office, and the exchange rates between varieties of silver and copper coins circulating in China were determined by their metallic contents. Banks kept their reserves in silver, and balanced their interbank accounts in silver. Starting from 1913, the rapid development of both Chinese and foreign banks substantially increased the supply of banknotes. The banks consented to converting into silver, upon demand, the banknotes they issued to their customers. A national law enacted in 1914 stipulated the banknotes to be secured by 60 percent cash reserves and 40 percent securities, though it is not clear whether the law was strictly enforced. A Chinese central bank in the modern sense did not exist before 1935.

It is a consensus among historians that the currency's linkage to silver limited the government's ability to manipulate the monetary system. It is also believed that the free silver standard of China acted as a check on the excessive issuing of notes by the warlords and local governments (Chang, 1958, pp. 4-5). The public demand for redemption in silver meant that attempts of provincial governments to issue excessive notes resulted in depreciation of the notes and strong resistance to accepting the notes.

A prominent example is the Peking Banknote Agitation of 1916. In early 1916, informed by a plan of the Republican government (led by the president, Yuan Shikai) to raise revenues by issuing irredeemable banknotes under the Bank of China and the Bank of Communication, the public rushed to convert their banknotes into silver. To respond, in May 1916 the government stopped the convertibility of banknotes to silver, froze withdrawals on deposits, and forced the acceptance of irredeemable banknotes in the private sector. These prescriptions were enforced in areas surrounding Peking, then under the control of Yuan's regime, but were resisted in Shanghai and nearby cities. Immediately following the announcement of the government decree, silver disappeared from circulation, and merchants were reluctant to exchange their goods for worthless banknotes. Foreign banks, under their extraterritoriality, refused to accept the banknotes. The harmful impact on the economy was soon felt and the government decree was publicly violated, as both the public and private sectors discounted or refused to accept the banknotes. In the end, the policy was abandoned and the government had to float loans several times during 1917-1923 to redeem these banknotes (Cho, 2009, pp. 159-163). The 1916 Agitation is an example that the silver standard enabled the private sector to

[①] France during the bimetallic era, for example, effectively pegged the exchange rate between silver and gold at its legal ratio of 15.5 : 1.

safeguard itself from the abuse of government power.[①]

2.2 Silver and the Chinese economy

The inability to manipulate its monetary system made China's economy subject to influences of external developments. History shows a stable and predictable relationship between the world silver price and the Chinese price level. The silver price dropped in 1920, after a rising trend during 1915-9. Silver in London declined from 61.50 pence per ounce in 1920 to 17.65 pence in 1930. Such a drastic change was due to the end of World War I and the lift of Great Britain's ban on silver exports. During the same period, China experienced a mild and steady inflation.

This strong linkage between the world silver price and Chinese price levels was also evident during the most volatile years (1929-35), when the silver price in terms of US dollar declined roughly 50 percent during the first two years of the Great Depression. The Chinese price level was increasing during October 1929-August 1931, while price levels of major gold standard countries were declining significantly.

The tide reversed in 1931, when Great Britain abandoned the gold standard and devalued the pound in September 1931. The Scandinavian and several other European countries followed suit, and the silver price immediately jumped. In early 1933, the United States abandoned the gold standard, and there was another rapid rise in the silver price in relation to the devalued dollar. By the end of 1933, the Chinese dollar had appreciated in relation to the major currencies of China's trade and finance. In June 1934, the U.S. Congress passed the Silver Purchase Act, which accentuated the already rising silver prices since 1931. China found itself in deflation and economic depression amid a rising world silver price and its silver currency. At a time when other countries had depreciated their currencies to check deflation and bring about recovery, China had seen the value of its silver currency rise out of line with the general level of commodity prices. This brought severe deflationary effects. These contrasting economic trends caused by changes in the price of silver illustrate the vulnerability of the Chinese economy to silver fluctuations.[②]

2.3 Theoretical consideration

To explain this linkage, the literature suggests two channels through which changes in silver price (hence, the external value of the Chinese currency) exerted their effects on the Chinese economy. One was through changes in the exchange rate, which directly affected the price level and economic activity (the exchange rate channel). The other was through changes in silver stocks, which had direct consequences for domestic money supply and domestic credit and subsequently influenced the price level, employment, and general business activities (the monetary channel).

- Exchange rate channel: silver price falls → exchange rate depreciates → commodity prices rise → price level increases

- Monetary channel: silver price falls → silver inflows → silver stocks increase → money supply and domestic credit increase → price level increases (viatrade balances: real depreciation → stimulus to exports → trade surplus →net silver inflows and stimulate price level)

By the exchange rate channel, an increase in world silver price drove up theexternal value of Chinese currency and caused deflation of commodity prices. This was because under the silver standard the nominal price of silver was fixed in terms of Chinese currency. A rise in the price

[①] For interested readers, the following references provide further historical background. For a general history of Chinese silver standard, see Wang (1981) and von Glahn (1996). For modern Chinese currency, see Kann (1927). For monetary history of modern China, see King (1965). For monetary policy and silver debates, see Brandt and Sargent (1989) and Friedman (1992).

[②] For studies exploring the effects of world silver price on the Chinese economy between 1929 and 1935, see T'ang (1936), Leavens (1939), Young (1971), Brandt and Sargent (1989), Myers (1989), Rawski (1989), Friedman (1992), Lai and Gau (2003), Burdekin (2008) and Shiroyama (2008).

of silver called for the prices of other commodity to fall and this resulted in deflation. Analogously, a decrease in the world silver price drove down the external value of Chinese currency and caused inflation of commodity prices. Moreover, being a price-taker for import and export commodities, changes in the silver exchange rate were quickly transmitted into the silver prices of import and export commodities. This made a decrease (increase) in the silver price to be followed up by a rise (fall) in the prices of import and export commodities.

By the monetary channel, a drop in silver price and exchange rate tended to result in import of silver, increasing both bank reserves and supply of money, and hence, raising the general price levels. Conversely, the rising silver price and exchange rate tended to result in an outflow of silver, decreasing both bank reserves and money supply, and thus causing a deflationary tendency.The silver flows and their monetary consequences were the results of arbitrage activities. Changes in the world silver price also have implication for silver flows through trade balances. When the silver price and exchange rate were high, imports into China were stimulated and exports from China were hindered. The inverse occurred when the silver price and exchange rate were low. A trade balance was to be followed up by net silver flows which changed the stock of silver and money supply and had consequences for output and price level.

There is, however, no study attempting to evaluate the relative importance of the two channels, and a common practice is to choose either one of the two channels that best fits the chosen hypothesis. The monetary channel seems to dominate theoretical and popular expositions of the Chinese silver standard. For example, Shiroyama (2008, pp. 34-5) emphasizes the role of the monetary channel in the 1920s. She argues that low world silver price caused silver to flood into China throughout the 1920s. The imported silver was converted into sycees (a particular form of Chinese silver bullion that backed the issue of banknotes) or coins, thus increasing money supply. Increases in silver stock provided the basis for credit expansion. The mild and steady inflation during this period was the consequence of this monetary channel. Similarly, T'ang (1936, pp. 61-78) and Young (1971, p. 176) argued that this monetary channel was responsible for the Chinese economic misery between 1932 and 1935. For them, the rise in the silver price siphoned off large amounts of silver, bringing about contraction in money and credit, and thus causing deflation and depression in China. Friedman and Schwartz (1963, pp. 489-91) emphasized the trade balance aspect of the monetary channel. They argued that appreciation of the Chinese currency caused a decline in exports relative to imports. The deficit in the trade balance was met by export of silver, which in its turn contracted the internal money supply and caused deflation and recession.

In contrast, Chang (1988, p. 71) stressed the role of the exchange rate channel in causing Chinese economic difficulties between 1932 and 1935. He argued that "By international arbitrage, Chinese dollar prices of many commodities fell as a direct consequence of the appreciation of the Chinese currency, independent of China's money supply."[①]

[①] Our distinction between exchange rate and the money as two different shock transmission mechanisms under the silver standard has its forerunners. Batchelder and Glasner (1995, 2012), in the context of the gold standard, made a distinction between two explanations to the transmission of the Great Depression: the monetary theory of the Great Depression developed by Ralph G. Hawtrey and Gustav Cassel and the monetary theory based on the price-specie-flow mechanism, represented by Milton Friedman and Anna Schwartz. According to the Friedman-Schwartz view, a country's money supply was determined by the quantity of gold reserves held by the banking system. The gold reserves in turn were determined by international gold flows that occurred when there was trade imbalance. A country's price level was the results of international gold flows and the associated changes in money supply. According to the Hawtrey-Cassel view, given the internationally determined value of gold, a country's price level is dictated by the conversion rate of its national currency into gold. A tight correlation between gold reserves and the supply of money was neither necessary theoretically nor observed empirically. The Hawtrey-Cassel view corresponds to our exchange rate channel, while the Friedman-Schwartz view corresponds to our monetary channel. Batchelder and Glasner (1995, p. 299) postulate that the Chinese experience during the early 1930s "demonstrates that shifts in the international supply or demand for a precious metal used as a monetary standard can cause inflation or deflation in countries without first altering the domestic quantity of money." Our empirical findings below are consistent with their assertion.

3 Methodology

We follow the methodology of Bernanke et al. (1997), Sims and Zha (2006), Bachman and Sims (2011), and Kilian and Lewis (2011) to answer the questions posed above. The method has been used to quantify the extent to which the endogenous policy response of a central bank to oil price shocks has contributed to real output contraction. This method is used here to quantify the exchange rate and monetary channels, through which fluctuations in silver price operate their effects on the Chinese economy.

Let SP_t be New York silver price, ER_t be Chinese exchange rate, ST_t be silver stocks, and WPI_t be Shanghai wholesale price index. Starting from the structural VAR of order p :

$$A_0 \cdot Y_t = A_1 \cdot Y_{t-1} + A_2 \cdot Y_{t-2} + \cdots + A_p \cdot Y_{t-p} + \varepsilon_t \qquad (1)$$

where $Y_t = (SP_t \ ER_t \ ST_t \ WPI_t)'$, K is the number of variables, A_0 is a $K \times K$ lower triangular matrix with ones on the diagonal, and ε_t is a $K \times 1$ vector of mutually uncorrelated structural shocks. Define the $K \times (K \cdot (1 + p))$ matrix B as $B \equiv (I_k\text{-}A_0\ A_1\ A_2 \ldots A_p)$. It can be shown that the contribution of variable i to the response of the exchange rate at horizon h to a silver price shock at date 0 is given by:

$$d_{ER,i,h} = \sum_{m=0}^{\min(p,h)} B_{2,mK+i} \cdot \theta_{i,1,h-m}, \quad h = 0, 1, 2, \ldots, \quad i = 1, 2, \ldots, K \qquad (2)$$

where $B_{2,mK+i}$ refers to the $(2, mK + i)$ element of the matrix B, and $\theta_{i,1,h-m}$ refers to the (i, 1) element of the $K \times K$ impulse response coefficient matrix at horizon $h-m$, denoted by Θ_{h-m} and defined in Lutkepohl (2005, p. 46).

To quantify the exchange rate channel, we create a hypothetical sequence of shocks to the exchange rate, which offsets the contemporaneous and lagged effects of world silver price on the exchange rate:

$$\varepsilon_{ER,h} = -B_{2,1} \cdot x_{1,h} - \sum_{m=1}^{\min(p,h)} B_{2,mK+1} \cdot z_{1,h-m}, \quad h = 0, 1, 2, \ldots \qquad (3)$$

where $x_{i,0,}$ i = 1, 2, . . . , K denotes the impact response of variable i to silver priceshocks in the absence of hypothetical shocks. Given the hypothetical shocks to the exchange rate, the counterfactual impulse response at the impact period h=0 of variable i to silver price shocks becomes:

$$z_{i,0} = x_{i,0} + \frac{\theta_{i,2,0} \cdot \varepsilon_{ER,0}}{\sigma_2} \qquad (4)$$

where σ_2 denotes the standard deviation of the exogenous exchange rate shocks. Corresponding values for the subsequent periods, h=1, 2, . . ., are computed re-cursively as:

$$x_{i,h} = \sum_{m=1}^{\min(p,h)} \sum_{j=1}^{K} B_{i,mK+j} \cdot z_{j,h-m} + \sum_{j<i} B_{i,j} \cdot x_{j,h} \qquad (5)$$

$$z_{i,h} = x_{i,h} + \frac{\theta_{i,2,0} \cdot \varepsilon_{ER,h}}{\sigma_2} \qquad (6)$$

The difference between the actual and counterfactual responses measures the effects of world silver price on Shanghai WPI working through the exchange rate. An analogous procedure is employed to quantify the monetary channel.[①]

Our counterfactual exercises involve a kind of policy regime change, the evaluation of which requires taking expectations into account. Thus one concern is that our construction of counterfactual is subject to the Lucas critique. The best wayto solve this issue is to employ a structural model for our purpose. However, given the lack of a commonly accepted structural model for the metallic standards, here we employ a reduced-form approach, namely, the VAR model, for our counterfactual exercises. The VAR approach is not invulnerable to the Lucas critique, but the structural VAR model allows us to identify the one structural shock that is most important for our analysis, namely, the world silver price shocks. Moreover, it allows us to accommodate the time-series facts about the Chinese economy in a flexible manner. Like the literature that employs this method, we assume that the policy changes contemplated are small enough not to affect the structure of the economy materially, and it takes some time for people to learn that policy was not going to respond in its usual way (Sims and Zha, 2006; Kilian and Lewis, 2011). The answer provided by the method is best regarded as a first-order approximation.

4 Descriptive statistics

Before proceeding to the VAR analysis, this section provides some descriptive statistics and highlights patterns the data exhibit. The time series we employ includes the New York silver price, exchange rate, silver stocks, wholesale price index, nominal interest rate and a proxy for money supply.[②] All series are of monthly frequency. The New York silver price is expressed in cents per ounce. Exchange rates are expressed as US dollars per 100 Chinese dollars. Silver stocks are the sum of silver dollars, silver sycees and silver bars, expressed in thous and taels. We consider Shanghai WPI (1926=100) and Tientsin WPI (1926=100).[③]Money supply is expressed in million Chinese dollars. The nominal interest rate is annualized and in percentage. Except for the Tientsin WPI, which is taken from Kong (1988) ed.: Nankai Economic Indicators, all the other series are taken from various issues of Tongji Yuebao.

Due to data restrictions, the beginning year of our analysis is 1928. Our data end at September 1934, one month before the linkage between the exchange rate of the Chinese currency and the world silver price was disrupted by the measures of capital control adopted by the Chinese government (Ho et al., 2013).[④] On October 14, 1934, the Chinese government issued an order, effective on October 15, to impose a 7.75% customs duty on exports of silver dollars and mint bars and a 10% customs duty on exports of other forms of silver. In addition, anequalization charge was imposed to make the exports of silver unprofitable.[⑤]

[①] An appendix that describes the methodology in great detail can be obtained from the corresponding author.

[②] We use banknotes issued by the Bank of China, Shanghai Branch as a proxy for money supply. This is because Bank of China, Shanghai Branch was the largest note-issuing bank during the study period and the series was complete and reliable. According to our calculation, the banknotes issued by the Bank of China, Shanghai Branch, accounted for 11.6% of the aggregate money supply in 1934.

[③] Tientsin was a treaty port city in North China close to Peking (2−3 hours by train in the 1930s). There some are other treaty port cities also important in international trade, such asCanton (Guangzhou). We focus on the Shanghai WPI and take Tientsin WPI for comparison. The reason to select Tientsin is simply because that is the only city with monthly statistical data; see Kong (1988) ed.: Nankai Economic Indicators. Using the data provided by Hsiao (1974), the proportions of China's international trade that went through the principal ports between 1928 and 1932 were (in descending order): Shanghai (48%), Dairen (15%), Tientsin (10%), Canton (6%), Yangtze (5%), Tsingtao (4%), Harbin (3%), Antung (3%), Kowloon (3%), and Hankow (3%).

[④] This paper does not deal directly with the Great Depression, but covers a period of time that overlaps the Great Depression. During the first two years of the Great Depression, from October 1929 to August 1931, China was less affected than any other major country. Several studies have discussed China's economy performance during the Great Depression, especially why and how silver standard worked to insulate China from the Great Depression (Salter, 1934; Friedman and Schwarz, 1963; Wright, 1991; Lai and Gau, 2003). This is an important issue that deserves a separate treatment, see Ho and Lai (2013).

[⑤] For computation of the equalization charge, see Leavens (1939, pp. 300-1).

[Figure 1 about here]

Figure 1 plots the New York silver price, Shanghai WPI and Tientsin WPI. The New York silver price and Shanghai WPI (Tientsin WPI) are negatively correlated, with a correlation coefficient of −0.71 (−0.42). From 1928 to 1931, the falling New York silver price was accompanied by a rising Shanghai WPI (Tientsin WPI); from 1932 to 1934, the rising New York silver price was accompanied by a falling Shanghai WPI (Tientsin WPI).

We divide the study period into two sub-periods, one from February 1929 to August 1931 and the other from September 1931 to September 1934. September 1931 is chosen as the dividing point because Shanghai WPI started to decline. Table 1 reports the correlation between the variables for the whole period and the two sub-periods. The table shows that world silver price was positively correlated with the exchange rate and negatively correlated with the Shanghai WPI. The relationships were stable across the two sub-periods. Our counterfactual simulations below demonstrate that the silver price affected the Shanghai WPI primarily through the exchange rate. By contrast, there was no stable relationship between silver price and silver stocks. Nor was there a stable relationship between silver stocks and the Shanghai WPI. Silver prices were negatively correlated with silver stocks during the first sub-period, but the correlation turned positive during the second sub-period. The inverse is true for the relationship between silver prices and Shanghai WPI. As expected, silver stocks were negatively correlated with interest rate. However, there was no stable relationship between silver stocks and the money supply.[①]

[Table 1 about here]

5 Transmission mechanism and counterfactuals

5.1 Basic features

To begin with, we explore the linkage between New York silver price and Shanghai WPI, ignoring for the moment the transmission mechanisms.[②] Table 2 reports the results of pair-wise Granger causality test. New York silver price Granger causes Shanghai WPI and Tientsin WPI at the 1% significance level. The causality is clearly from world silver price to Shanghai WPI (Tientsin WPI), and not the other way around. It is also more difficult to make a case for the reverse causality for Tientsin WPI than for Shanghai WPI, because the p-value for Tientsin WPI (0.94) is much larger than for Shanghai WPI (0.15).[③]

[Table 2 about here]

[①] Using annual trade data from Hsiao (1974), it can be shown that between 1864 and 1934, the relationship between trade balances and silver price was not consistent with the theoretical prediction. This anomaly concerning foreign trade balances and the world silver prices was first noticed by Remer (1926), and later taken up by Cheng (1956; 1986). Both authors gave an account of various factors that might have obscured the effects of silver prices on China's foreign trade. The fact that various factors had obscured the effects of silver prices makes the impulse responses of trade variables to silver price shocks either insignificant or of the wrong sign. In the subsequent analyses, we shall be confined to the analysis of a VAR model that excludes trade variables. The present paper is therefore focused on the influence of silver price upon price level, and the links between silver price shocks and real variables is left for future research.

[②] 12Since all the variables except nominal interest rate are integrated of order one, and there is no cointegrating relationship between the variables, we employ the logarithm difference of the variables in the Granger causality test and VAR analysis.

[③] It can be shown that shocks to New York silver price have significant effects on Shanghai WPI, and the shocks are completely transmitted 2 months following the shock; on the contrary, shocks to Shanghai WPI have only insignificant effects on New York silver price. Since Tientsin was a coastal but less international city, while Shanghai is a cosmopolitan metropolis with intensive foreign trade and financial connections, it takes longer time for a silver price shock to be fully transmitted into the Tientsin WPI, and its accumulated effects are also smaller.

To show that the above linkage between price of silver and Shanghai WPI was a long-term phenomenon, we redo the test using an extended data set from January 1921. The last two rows of Table 2 report the results using this longer sample, reconfirming the unilateral causality running from New York silver price to Shanghai WPI, and not the other way around.

Kreps (1934) suggested that as an important factor in the demand for silver, it was Chinese business conditions that determined the silver price, and not the reverse. According to Kreps, between 1926 and 1932, industrialization, modernization, and war inflation caused an unfavorable balance of trade for China, and exerted downward pressure on the Chinese exchange rate and the silver price. Kreps (1934) did not explain how a downward pressure on exchange rate could
lead to a fall in silver price, but his view explicitly postulated a causality running from a rising Chinese price level to the falling silver price. Table 2 rejects Kreps' conjecture.

5.2 Quantifying the exchange rate and monetary channels

Having established a causal link between the world silver price and Shanghai WPI, we proceed to explore the transmission mechanisms. For that purpose, we estimate a structural VAR model that includes four variables: New York silver price, exchange rate, silver stocks, and Shanghai WPI. We follow the common practice to check seasonality and find that there is seasonality in the series of New York silver price, exchange rate, and the silver stocks. We add to the VAR model three dummy variables, which correspond to the dummies for January, June and December, respectively, to capture these particular seasonal effects.

In our benchmark model, we use a single lag of one month, and the lag length is chosen in a standard way. The data limitation forces us to be parsimonious to obtain efficient estimates. Moreover, the long-run relationship between the Chinese exchange rate and the metallic value of the Chinese dollar also suggests that a lag of one month is optimal (Ho et al., 2013). Later in the paper we will examine the sensitivity of our results to the choice of lag length. Since our sample covers a period of time that overlaps with the Great Depression, it is interesting to see whether there is a structural break in the VAR coefficients. The likelihood ratio test of Sims (1980) is used to test for these cross-equation restrictions. The statistic equals 9.23 (well below the critical value $\chi 0.05,20 = 31.41$), implying the stability of VAR coefficients.

Figure 2 plots the impulse responses of endogenous variables to a shock in the world silver price.[①] A shock of one standard deviation in the New York silver price causes the New York silver price to increase by roughly 5 percent. The exchange rate appreciates immediately by roughly the same magnitude. In fact, the response of exchange rate follows closely the response of New York silver price. The response of Shanghai WPI is negative and significant. The strong linkage between New York silver price and Shanghai WPI found in the bivariate ranger causality test also carries over to the four-variable VAR model. The response of silver stocks was negative but statistically insignificant. This does not support the importance of silver stocks as a transmission mechanism.

P[Figure 2 about here]

Since we presume exchange rate and silver stocks as two transmission variables, it is necessary to examine further their dynamics. The solid line in Figure 3 represents the response of the exchange rate to silver price shocks. Since the exchange rate is ordered second in the VAR model (just next to the silver price which is in the first position), the impulse response of exchange rate on the impact period is attributed solely to world silver price shocks. In the subsequent periods, the exchange rate responds to all lagged endogenous variables, including its own lags, by construction of the VAR model. Using equation (2), the response of exchange rate can be decomposed into four components, which are represented by the dotted and dashed lines in Figure 3. Each component stands for the contribution of one of the four endogenous variables to the response of exchange rate. Summing the dotted and dashed lines

[①] Since we employ logarithm difference of the time series (multiplied by 100) in the VAR analysis, the units for the vertical axis in all of the impulse response functions throughout the text are the growth rate of the original series.

one obtains exactly the solid line. Figure 3 shows that the silver price is the dominant force driving the response of exchange rate, followed by the dynamics of the exchange rate itself. The exchange rate responds mildly to the Shanghai WPI and is not responsive to silver stocks.

[Figure 3 about here]

The lower panel of Figure 3 plots the response of silver stocks to world silver price shocks and the decomposition of the response. On impact, shocks in the price of silver bring down silver stocks. However, the negative effects exerted by the silver price are offset by the positive effects of the exchange rate, meaning silver stocks hardly move on the balance. Subsequently, silver stocks decrease, mainly in response to world silver price. The exchange rate and Shanghai WPI also contribute to the response of silver stocks, but their effects are dominated by the effects of world silver price.

Now we can answer our main question of interest: what was causing the observed strong linkage between the price of silver and the Chinese price level? Was it because the silver price had a direct impact on the external value of the Chinese because the silver price first affected money supply which in turn changed the Chinese price level?

We begin with the exchange rate channel. For this, we conduct a thought experiment that shuts down the exchange rate channel, using the method described in section 3. Under the silver standard, a country has fixed the value of its currency to a certain amount of silver. The price of silver was fixed in terms of domestic currency and could not change. In this sense, it is a form of fixed exchange rate regime. Since the Chinese currency was fixed to silver, and silver flows were unconstrained, fluctuations in the silver price would quickly cause the Chinese exchange rate to change accordingly. The impulse response function, shown in Figure 2, clearly demonstrates this. The thought experiment of shutting down the exchange rate channel in fact assumes that Chinese currency is not fixed to silver, or it becomes floating relative to silver, so that fluctuations in silver price exert no effect on the Chinese currency. The purpose of this thought experiment is to quantify the impacts of silver price on the Chinese price level arising from the simple fact that Chinese currency was tied to silver.

The left panel of Figure 4 reports the results. The solid line in Figure 4 represents the actual response to silver price shocks, while the dashed line represents the counterfactual response. The difference between the two lines thus quantifies the effects of the exchange rate channel. This figure shows that the response of silver price is almost unaffected in the thought experiment. This is a further evidence that silver price is exogenous to the Chinese exchange rate. Since we only shut down the response of exchange rate to silver price, and allow the exchange rate to respond to other endogenous variables, the exchange rate response needs not be zero. Nevertheless, the response of the exchange rate is indifferent from zero in the counterfactual scenario, implying that silver price is indeed the dominant factor affecting the exchange rate. In the absence of the exchange rate channel, the Shanghai WPI would be much less affected by the silver price shocks.

To be specific, the cumulative changes in Shanghai WPI to a one-standard-deviation shock to world silver price is −1.68 percent, whereas it becomes −0.96 percent in the counterfactual scenario. In other words, the deflationary effects of rising silver price would be much milder if the Chinese exchange rate did not move accordingly. This finding confirms the concern of the Chinese policymakers who deemed the rising silver price since 1932 to be extremely harmful, and is consistent with their decision to impose capital controls after October 1934, which effectively delinked the Chinese exchange rate to silver price, resulting in the eventual departure from the silver standard in November 1935 to avert a silver-induced deflation spiral.[①]

[Figure 4 about here]

[①] The counterfactual response of silver stocks is lower than the actual response. The decomposition of response of silver stocks, shown in Figure 3, indicates that a change in exchange rate induces a corresponding change in silver stocks. In the counterfactual scenario, we have created negative shocks to the exchange rate to offset the positive impact of silver price shocks on exchange rate. These negative shocks to the exchange rate in turn cause silver stocks to decrease in the counterfactual scenario.

Now we turn to the monetary channel, and we conduct a thought experiment that makes silver stocks unresponsive to silver price shocks. This thought experiment assumes that changes in silver price do not induce silver flows into or out of China, and therefore have no consequence for money supply. The presence of a monetary channel requires two conditions. First, silver price must strongly affect silver stocks. Second, the Shanghai WPI must respond to silver stocks. Figure 2 has shown that the response of silver stocks to a silver price shock is indifferent from zero, so the first condition is not satisfied. A decomposition of the response of Shanghai WPI (not reported) also invalidates the second condition.

The right panel of Figure 4 reports the results. It is evident that the response of silver price and exchange rate are unaffected in the counterfactual scenario. In the absence of a monetary channel, the Shanghai WPI would be almost the same as it actually was. This implies that monetary channel is not systematically important in the transmission of silver price shocks. By construction, we have created a hypothetical sequence of positive shocks to silver stocks, which, together with the dynamics of silver stocks, cause silver stocks to increase in the counterfactual scenario.

5.3 Micro-level evidence

Our counterfactual simulations imply that the exchange rate had substantial influence on the Shanghai WPI. Is there other evidence to corroborate this result?

In fact, an observation has long been made that prices of Chinese imports and exports and prices of commodity in treaty port cities tended to fluctuate along with foreign commodities' prices and the silver exchange rate (Cheng, 1986). This was because China was a price-taker for both import and export goods. At latest after the 1880s, Chinese domestic goods became less competitive than imported goods, and Chinese tea and silk, China's two most important export goods, lost much of their markets to Indian tea and European silk, respectively. The case for the other Chinese export goods, such as cotton, beans, sugar and leather, for which Chinese production was small, could only be worse.[①] The fact that China was a price-taker in both import and export goods made Chinese import and export prices as well as commodity prices in treaty port cities highly dependent on the foreign commodity prices and the silver exchange rate. Using the export and import price indices for Shanghai, it can be shown that the falling prices of silver before mid-1931 were associated with rising prices of import and export goods, while rising prices of silver after mid-1931 were associated with the falling prices of import and export goods. This is consistent with the explanation that being a price-taker in international trade, China's silver exchange rate was the main force driving the prices of import and export goods.

We further examine the items making up the Shanghai WPI. The index of wholesale prices in Shanghai is made up of 155 commodities, classified into 8 groups: cereals (22 items, weights 14.2%), other food products and provisions (31 items, weights 20.0%), textile fibres and manufactures thereof (38 items, weights 24.5%), metals (12 items, weights 7.7%), fuels and lighting (13 items, weights 8.4%), building materials (11 items, weights 7.1%), chemicals and preparations thereof (10 items, weights 6.5%), and miscellaneous (18 items, weights 11.6%).

The index can also be classified according to the origin of goods: domestic goods (weights 54.2%) and foreign goods (weights 45.8%). The index is computed using a simple arithmetic average. There is no information on the fraction of traded goods making up the index, but the weight of foreign goods (45.8%) provides a lower bound for its value. Given this large fraction of traded goods in the WPI, it is reasonable to expect that the strong dependence of import and export prices on the silver exchange rate also carries over to the WPI.

Figure 5 plots the Shanghai WPI and indices for the first three groups of commodities, which make up 58.7% of the aggregate WPI. The plots end at December 1933, the last observation we have from the Chinese government publication, and a vertical line indicates the date from which the index starts to fall. Figure 5 shows that the overall WPI and the individual WPI

[①] The readers are referred to Cheng (1986, p. 4) for further details about price formation in China's import and export goods.

share the same general trend, increasing steadily until the middle of 1931 and falling steadily thereafter.[①]

[Figure 5 about here]

5.4 Historical simulation

As a further illustration, we consider two episodes of silver price fluctuations: from February 1929 to February 1931, when silver price was declining, and from May to 1933 to September 1934 (end of data), when international silver price started rising after the U.S. abandoned the gold standard in March 1933. These two episodes exhibit distinct trends in the world silver price that result in different trends for the Shanghai WPI, which is the reason for focusing on these two episodes. The thought experiment we conduct here is the same as in Section 6, but for two concrete episodes. This makes the effects of silver price on Shanghai WPI easier to understand. The purpose is to show that if Chinese currency was not tied to silver, the Shanghai WPI would not have moved in tandem (though in the opposite direction) with world silver price, first rising during the first episode and then falling during the second episode, and the Shanghai WPI would have been more stable than it actually was.

Figure 6 reports the simulations, with solid lines in the figures depicting the actual paths of the variables. Scenario 1 represents the case in which the estimated silver price shocks are fed into the VAR system while the other shocks are set to zero. Here exchange rate and silver stocks are allowed to respond to changes in silver price and the induced changes in the other variables. This scenario is intended to isolate the portion of each episode that results solely from the silver price shocks and the associated transmission channels. Scenario 2 represents the simulation in which the silver price shocks are fed into the VAR system, all the other shocks are shut off, and the exchange rate is not allowed to respond to changes in silver price. This scenario eliminates the effects of silver price shocks that work through the exchange rate channel. Similarly, Scenario 3 eliminates the effects of silver price shocks that work through the monetary channel.

[Figure 6 about here]

We begin with the first episode (Feb. 1929-Feb. 1931) shown in the left panel of Figure 6. For the New York silver price, exchange rate, and Shanghai WPI, Scenario 1 traces closely the actual series, implying that for this episode, it is primarily the silver price shocks that account for the variations in these variables. Scenario 3 also traces closely to historical data, implying that the monetary channel is not an important channel that transmits these shocks into China. In contrast, Scenario 2 sees a stable exchange rate and a milder inflationary trend in the Shanghai WPI. In other words, had Chinese currency not been tied to silver, the declining silver price during this episode would have not depressed the Chinese exchange rate and resulted in an inflationary trend in the Shanghai WPI.

The right panel of Figure 6 shows the second episode (May 1933-Sept. 1934). For New York silver price, exchange rate, and Shanghai WPI, Scenario 1 follows the actual series, even though not as closely as depicted in the left panel. Again, this indicates that fluctuations in the silver price account for most of the variations in the exchange rate and Shanghai WPI. Scenario 3 is indistinguishable from Scenario 1, reflecting the unimportance of the monetary channel. Scenario 2 sees a stable exchange rate and a milder deflationary trend in the Shanghai WPI. The Chinese

[①] The only index that does not fall after 1931 is the price index for the group chemicals and preparations thereof. This group consists of 10 items of goods and 9 of them are foreign goods, indicating the items are overwhelmingly foreign goods. The items include acid, soda ash, potassium chlorate, alum, paraffin, alcohol, and dyes. According to Kreps (1934), "The sudden rise of the domestic prices of chemicals in 1931 marks the end of a bitter conflict by gigantic American, German, and British chemical concerns to control the Chinese market." Since this group of goods constitutes only 6.5% of the items making up the WPI, it does not effect the general pattern of the WPI.

exchange rate would have remained stable and the Shanghai WPI would have deflated less in this episode, had Chinese currency been delinked from silver.

Admittedly, the silver price was important, but it was not the only factor affecting China's price level during the study period. Another significant factor was world commodity prices, which began to fall after 1929 due to the Great Depression, and the decrease in world commodity prices was transmitted into a decrease in Chinese prices. Between 1929 and 1931, the effects of falling world commodity prices on Chinese prices were offset by the steady falling of the silver exchange rate, and the Chinese prices continued to rise. Between 1932 and 1934, the rising prices of silver reinforced the effects of falling world commodity prices and put substantial downward pressure on the Chinese prices, thus bringing about price deflation (Myers, 1989). This explains why the prediction based on silver price shocks alone sometimes deviates from the actual series.

Another factor that affected China's price level was the great Yangtze River flood in the summer of 1931, which was one of the greatest natural disasters on record and affected millions of people. It caused a temporary rise in the prices of cereals and other food products in the summer of 1931, as shown in Figure 5. But with the aid of an American credit of US $9.2 million for wheat and flour and the government emergency program, the impacts of the flood on prices were temporary and under control (Young, 1971, p. 78).

Overall, the fact that some other factors might have also affected the Chinese price level does not obscure the strong linkage of China's price level to silver price.

6 Robustness

We have conducted a battery of tests for robustness and here we repor only the main findings. In quantifying the exchange rate channel, the hypothetical shocks offset only the response of the exchange rate to the silver price, but not the response of the exchange rate to other variables. Alternatively, a hypothetical sequence of shocks could be constructed to offset all endogenous dynamics in the exchange rate such that the exchange rate remains unchanged over time. Similarly, a hypothetical sequence of shocks could be constructed that offsets all endogenous dynamics in the silver stocks to quantify the monetary channel.[①] Our results are robust to such a modification in the counterfactual simulation.

Admittedly, a single lag of one month is different from the usual VAR analysis. One concern is that the lag length may be too short to give the data a chance to show delayed effects. Specifically, the VAR model may not be able to pick up changes in the silver stocks and the associated effects, because the effect of a shock to monetary policy tends to take a year or longer to reach its peak (Eden, 2005). To deal with this issue and at the same time to be parsimonious, we experiment with using lags 1 plus 4, lags 1 plus 7, lags 1 plus 12, lags 1 plus 4 plus 7, lags 4 plus 7 plus 10, and lags 1 plus 4 plus 7 plus 10. We find that including other lags indeed reveals delayed responses, but does not change our benchmark result that the exchange rate is important in the transmission of world silver price shocks, while silver stocks are not.[②]

Our results are not affected by the order of the variables in the VAR. The identification of silver price shocks is unchanged as long as New York silver price is on the first position. Moreover, reversing the order of exchange rate and silver stocks gives almost identical results.

Up to now, we take the stock of silver as the money variable. For robustness, we consider two other measures of the money variable: the growth of money supply and nominal interest rate. We redo the counterfactual simulations using these variables one at a time as the money variable, and the results are similar to the benchmark results.

Recall that silver stocks are the sum of silver dollars, silver sycees and silver bars. We also consider alternative model specifications by using individual components of the silver stocks.

① This is the counterfactual experiment conducted by Bernanke et al. (1997), Sims and Zha (2006), and Bachman and Sims (2011).

② The benchmark result is also unaffected by using lags 1 plus 2.

Using silver sycees and silver bars as money stock gives qualitatively the same results. Using silver dollars as the money stock, we obtain the unexpected result that money stock increases following a positive shock in silver price. But even so, our benchmark results remain.

7 Conclusion and discussion

In this paper we provide the first systematic investigation of how international silver price shocks were transmitted into the Chinese price level. We find that the exchange rate was an important transmission mechanism, while silver stocks were not. The mere fact that the Chinese currency was tied to silver made Chinese price levels subject to the ups and downs in silver prices.

Clearly, the constraint imposed by the free silver standard on the government meant that the Chinese economy lacked an institutional arrangement to halt silver inflows and outflows, let alone to launch a policy that could mitigate the inflationary or deflationary pressures caused by silver flows. The Chinese government can hardly be said to have had controls over the supply of money in the modern sense prior to the currency reform of November 1935. Our empirical study shows that such an institutional defect had long been there.

From 1929 to 1931, China was under inflationary pressures when the world silver price was on a downward trend; whereas from 1932 to 1934, China suffered from deflationary pressures while the silver price was rising. During 1929 to 1931, this institutional defect may have been benign, as it may have contributed to China's initial wave of industrialization that occurred in Shanghai and a few cities along the Yangtze River (Shiroyama, 2008, p. 38). The mild inflation in that period was generally beneficial to the economy. The fall of the silver price expanded the market for Chinese exports, shielded domestic industries from competition of imported goods, and attracted foreign investments (Coble, 1986, p. 85). Therefore, the public and the policymakers were slow in gaining awareness of the institutional defect. It was the rising world silver price after 1932, further stimulated by the U.S. abandonment of the gold standard in 1933, and the American Silver Purchase Act of June 1934, together with the resulting deflationary spiral that made explicit this major institutional defect of the silver standard.

The defect was so obvious that it finally forced policymakers to search for an alternative monetary regime. As H. H. Kung, the then Minster of Finance recalled, the Chinese authorities began to plan a currency reform when the U.S. silver purchase policy was enacted (Russell, 1972, p. 201). Arthur Young, financial adviser to the Nanking government, recalled that it was the extended suffering of acute deflation that changed the public's previous benign attitude toward the rising silver price (Young, 1971, p. 232). The departure from silver was welcomed, as it dispelled the anxiety among the business community that deflation might persist through further increases in world silver prices (Chang, 1958, p. 7).

In the long run, it is unclear whether freeing the government from the constraint of silver standard was a blessing or a curse. Budgetary institutions to prevent the abuse of this newly gained power and sustainable fiscal deficits are preconditions for a successful management of a fiat money system, but these conditions were not available to the Nationalist government. In fact, the potential dangers of the new system did not go unnoticed by the leading Chinese bankers in Shanghai (Chang, 1958, p. 8). Even the designers of the reform had proposed for the independence of the Central Bank and urged the government to reduce its dependency on deficit financing.

As pointed out by Young (1971, p. 152), one of the draftsmen of the plan, before the currency reform of 1935, inflation was not a feasible option to do away with debt payments. Banknotes were redeemable in silver on demand, and an issue of fiat money would have promptly forced inconvertibility. Although in 1935 the government had never considered an inflationary solution, the currency reform of 1935 did make such a solution technically possible and practically attractive, though it finally led to the eventual financial collapse of the Nationalists when a total confrontation with Japan started in mid-1937.

Admittedly, the price indices we use can be criticized as representing the situation at Shanghai and at most other trade port cities, rather than in the countryside and China as a whole. We therefore call for caution in interpreting our results. China was a complex economy having both independent and integrated markets that coexisted in ways still not fully understand. To understand what precisely happened to Chinese economy in the early 1930s, Myers (1989)

surveyed economic situations in several urban centers and rural areas. The mosaic he provided is more like "Rashomon" than "The Blind Men and the Elephant", and this complexity is a given constraint to any exploration of the Chinese economy.

In the debate about the impact on China of the American Silver Purchase Act (ASPA, 1934), Friedman and Schwartz (1963) and Friedman (1992) argued that the ASPA substantially reduced China's monetary stock and caused deflation, while Brandt and Sargent (1989) and Rawski (1993) disagreed with Friedman's view and argued that the total Chinese money supply did not decline but continued to grow rapidly following the U.S. silver purchase. Both sides of the debate, however, believed the price of silver affected China by changing the supply of money, and they differ only in whether Chinese money supply had actually decreased or increased. However, our analysis above suggests that they might have misplaced their focus because silver price affected Chinese price level primarily through exchange rate, not through money supply. This important issue concerning effects of the ASPA and their transmission mechanisms is left for future research.

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Table 1: Correlation between Variables of Interest

From February 1929 to September 1934			
	Exchange Rate	Shanghai WPI	Silver Stocks
World Silver Price	0.99	-0.65	-0.03
	Shanghai WPI	Interest Rate	Money Supply
Silver Stocks	-0.65	-0.45	-0.31
From February 1929 to August 1931			
	Exchange Rate	Shanghai WPI	Silver Stocks
World Silver Price	1.00	-0.96	-0.68
	Shanghai WPI	Interest Rate	Money Supply
Silver Stocks	0.53	-0.10	0.60
From September 1931 to September 1934			
	Exchange Rate	Shanghai WPI	Silver Stocks
World Silver Price	0.98	-0.75	0.67
	Shanghai WPI	Interest Rate	Money Supply
Silver Stocks	-0.95	-0.76	-0.25

Source: All the series are taken from various issues of *Tongji Yuebao*.

Note: All series are of monthly frequency. The New York silver price is expressed in cents per ounce. Exchange rates are expressed as US dollars per 100 Chinese dollars. Silver stocks are expressed in thousand taels. The base year for Shanghai WPI is 1926. Money supply is expressed in million Chinese dollars. The nominal interest rate is annualized and in percentage. The table reports the correlation between the variables for the whole period and the two sub-periods, one from February 1929 to August 1931 and the other from September 1931 to September 1934. The table shows that world silver price was positively correlated with the exchange rate and negatively correlated with the Shanghai WPI. The relationships were stable across the two sub-periods. By contrast, there was no stable relationship between silver price and silver stocks. Nor was there a stable relationship between silver stocks and the Shanghai WPI.

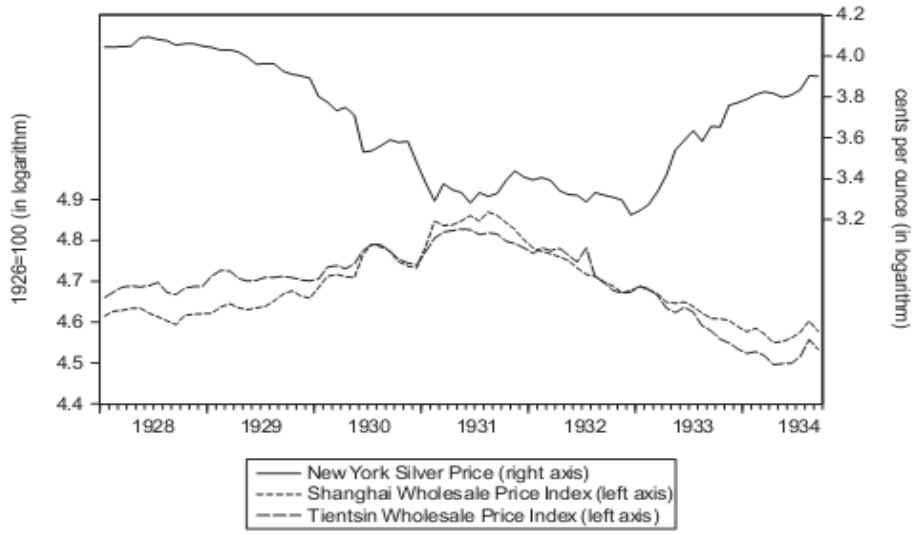
Table 2: Granger Causality Tests

Null Hypothesis	N=	F-statistic	p-value
January 1928 – September 1934			
New York silver price does not Granger cause Shanghai WPI	79	9.848	0.00
New York silver price does not Granger cause Tientsin WPI	79	7.357	0.00
Shanghai WPI does not Granger cause New York silver price	79	2.089	0.15
Tientsin WPI does not Granger cause New York silver price	79	0.005	0.94
January 1921 – September 1934			
New York silver price does not Granger cause Shanghai WPI	143	2.506	0.01
Shanghai WPI does not Granger cause New York silver price	143	1.625	0.09

Source: See Table 1.

Note: The table reports the results of pair-wise Granger causality test. The table shows that New York silver price Granger causes Shanghai WPI and Tientsin WPI at the 1% significance level. The causality is clearly from world silver price to Shanghai WPI and Tientsin WPI, and not the other way around. Lower panel of the table reports the causality test using an extended data set from January 1921. The results reconfirm the unilateral causality running from New York silver price to Shanghai WPI.

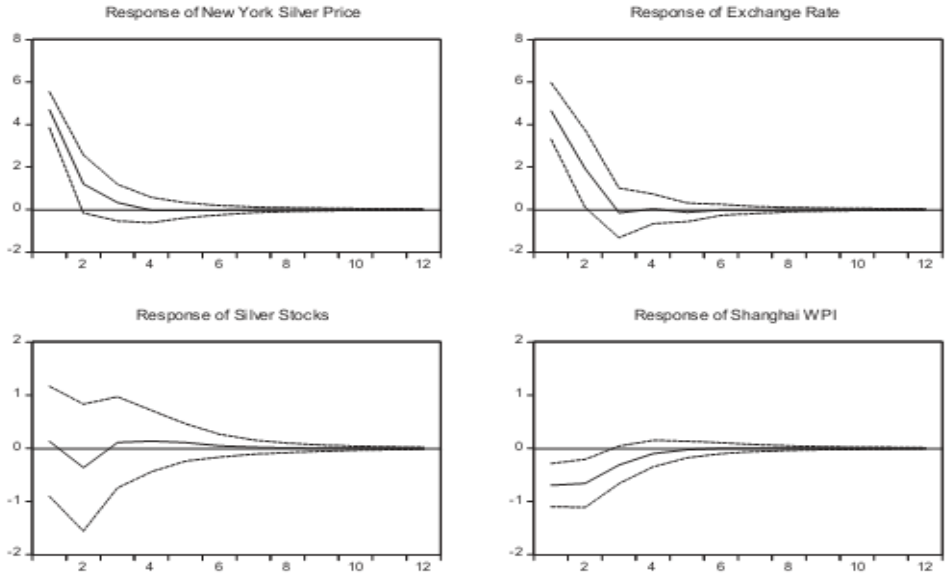
Figure 1: New York Silver Price and Wholesale Price Indices in Shanghai and Tientsin



Source: The New York silver price and the Shanghai WPI are taken from various issues of *Tongji Yuebao*. The Tientsin WPI is taken from Kong (1988) ed.: *Nankai Economic Indicators*.

Note: The New York silver price is expressed in cents per ounce. The base year for Shanghai WPI and Tientsin WPI is 1926. All series are of monthly frequency and are plotted in logarithm scale. The figure shows that New York silver price and Shanghai (Tientsin) WPI are negatively correlated. From 1928 to 1931, the falling New York silver price was accompanied by a rising Shanghai (Tientsin) WPI; from 1932 to 1934, the rising New York silver price was accompanied by a falling Shanghai (Tientsin) WPI.

Figure 2: Impulse Responses to World Silver Price Shocks



Note: The figure plots the impulse responses of endogenous variables to a shock in world silver price, obtained from a 4-variable VAR that includes New York silver price, exchange rate, silver stocks, and Shanghai WPI. The solid line represents the point estimate, while the dashed line represents the confidence interval computed from 500 Monte Carlo repetitions. The units for the vertical axis in all of the impulse response functions are the growth rate of the original series. The figure shows that a shock of one standard deviation in New York silver price causes the New York silver price to increase by roughly 5 percent. The exchange rate appreciates immediately by roughly the same magnitude. The response of Shanghai WPI is negative and significant.

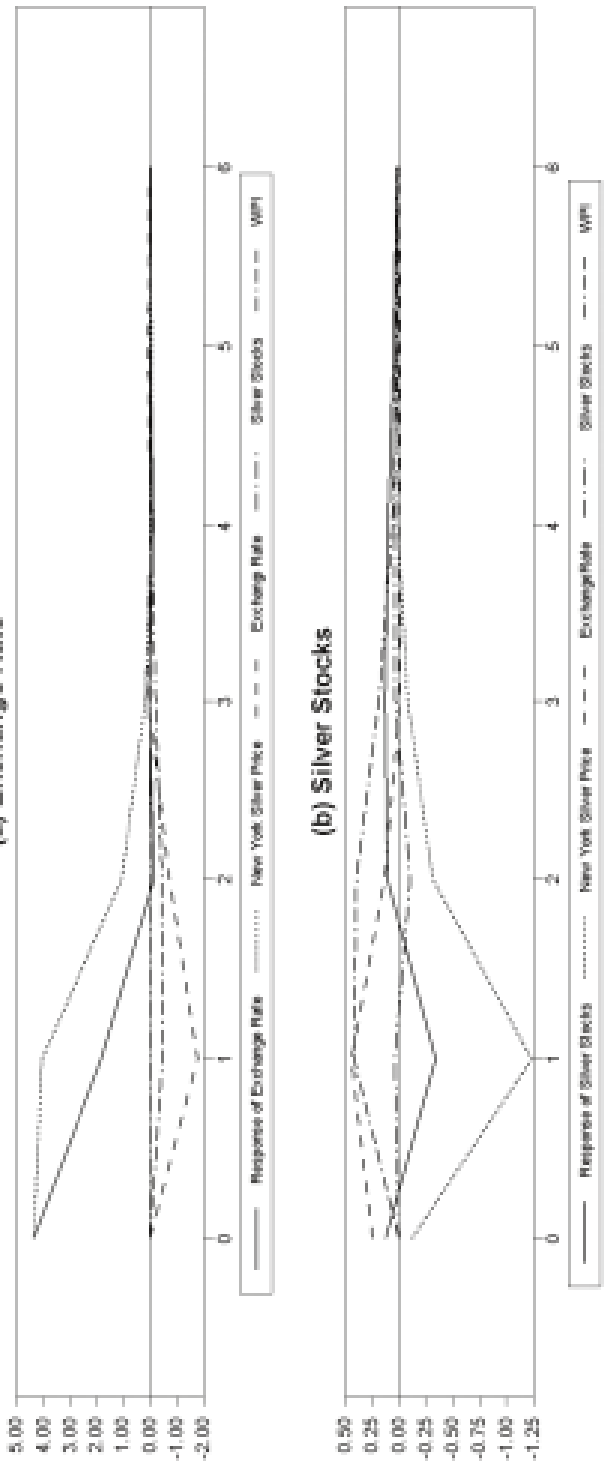
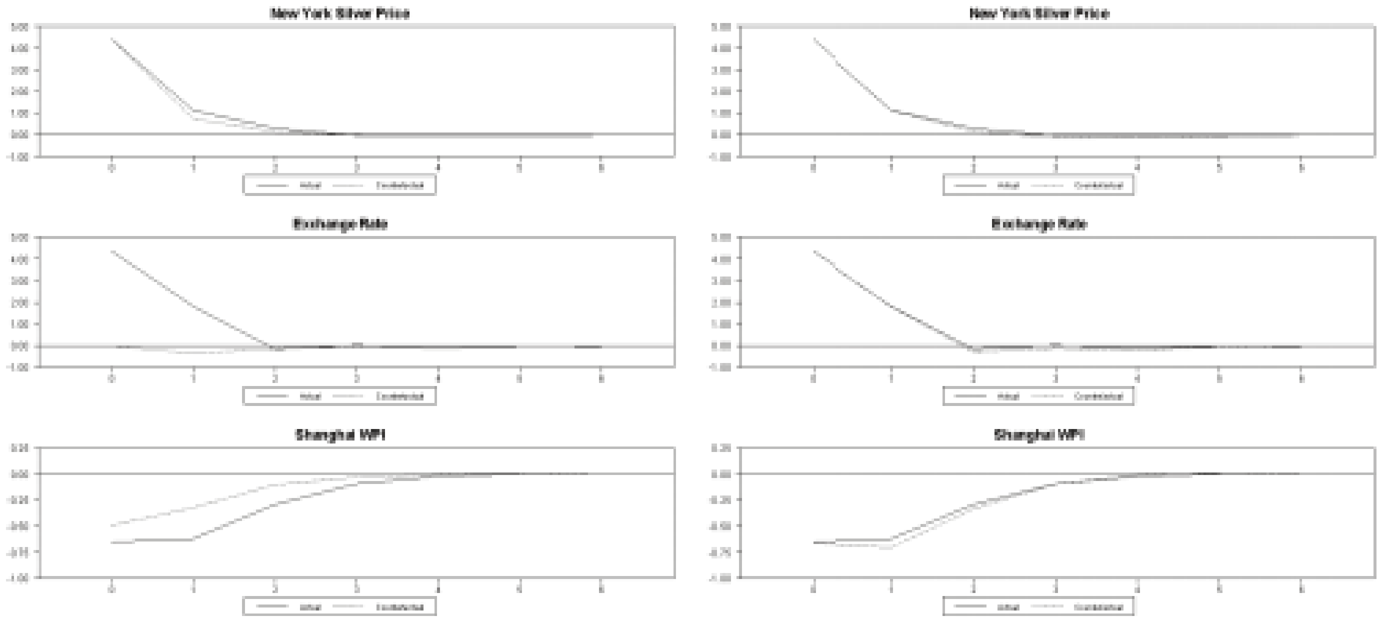


Figure 3: Decomposition of Responses

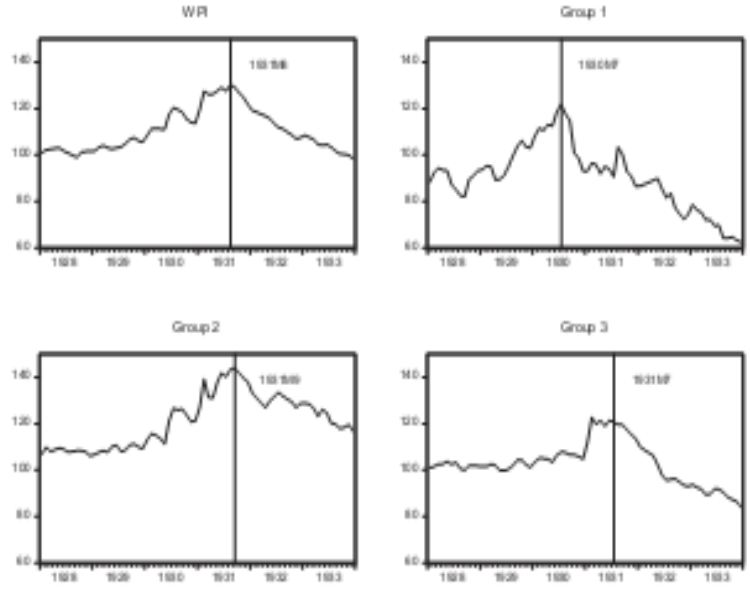
Note: The solid line represents the response of exchange rate (silver stocks) to silver price shocks. The response of exchange rate (silver stocks) is decomposed into four components, which are represented by the dotted and dashed lines. Each component stands for the contribution of one of the four endogenous variables to the response of exchange rate (silver stocks). Summing the dotted and dashed lines on each date exactly the solid line. The figure shows the silver price shock drives both the response of exchange rate and silver stocks.

Figure 4: Counterfactual Responses to World Silver Price Shocks



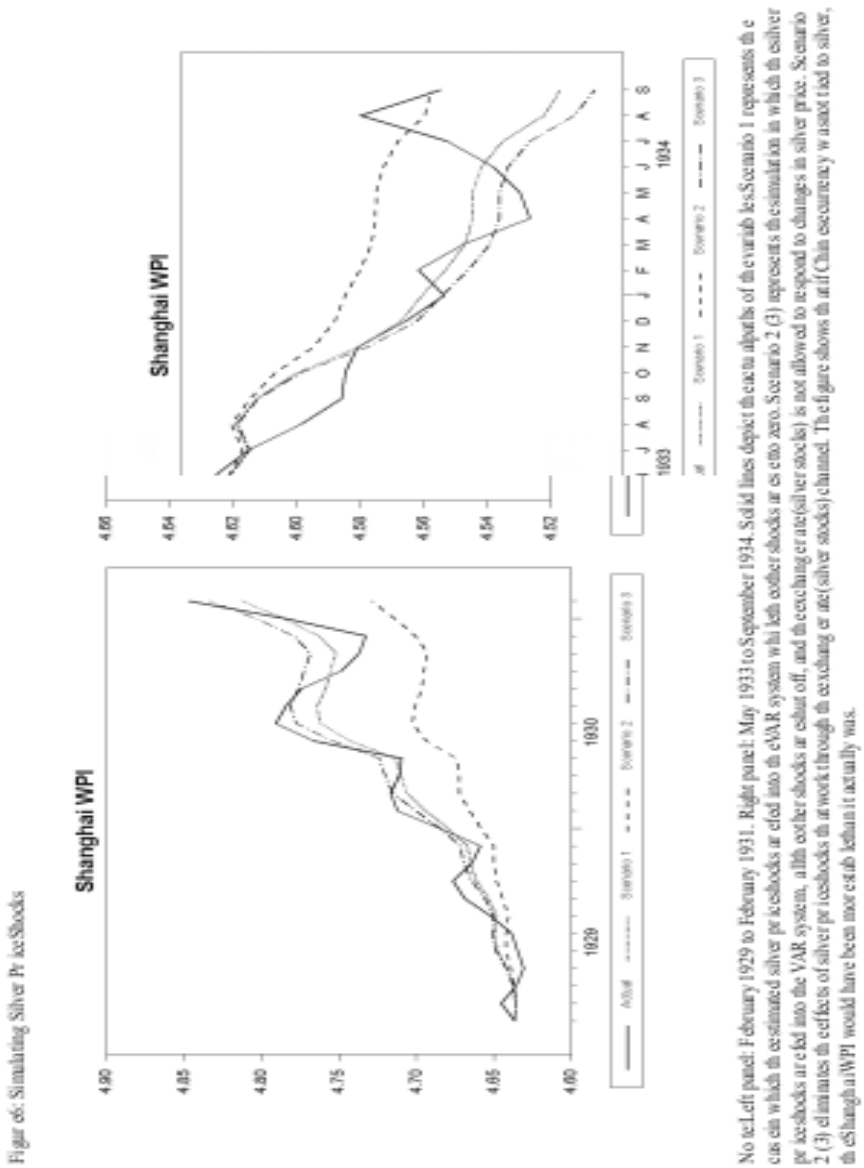
Note: Left (right) panel of the figure reports the thought experiment that makes exchange rate (silver stocks) unresponsive to silver price shocks. The experiment quantifies the impacts of silver price on the Shanghai WPI working through exchange rate (silver stocks). The solid (dashed) line represents the actual (counterfactual) response to silver price shocks. The left panel shows that in the absence of the exchange rate channel, the Shanghai WPI would be much less affected by the silver price shocks. The right panel shows that in the absence of the monetary channel, the Shanghai WPI would be almost the same as it actually was. The results imply that exchange rate was the main channel through which world silver price affected the Shanghai WPI.

Figure 5: Shanghai Wholesale Price Index and Indices for Three Groups of Commodities



Source: The indices for each group of commodities making up the Shanghai WPI are obtained from Directorate-General of Budget, Accounting and Statistics (1972), *Statistic Summary* (*Zhong Hua Min Guo Zheng Fu Tong Ji Ti Yao*).

Note: The index of wholesale prices in Shanghai is made up of 155 commodities, classified into 8 groups: cereals, other food products and provisions, textile fibres and manufactures thereof, metals, fuels and lighting, building materials, chemicals and preparations thereof, and miscellaneous. The figure plots the Shanghai WPI and indices for the first three groups of commodities, which make up 58.7% of the aggregate WPI. Group 1, 2, and 3 refers to cereals, other food products and provisions, and textile fibres and manufactures thereof, respectively. The figure shows that the overall WPI and the individual WPI share the same general trend, increasing steadily until the middle of 1931 and falling steadily thereafter.



Figur e6: Simulating Silver Pr iceShocks

No ne.Left panel: February 1929 to February 1931. Right panel: May 1933 to September 1934. Solid lines depict the ex tra nlpaths of the ev ariab les.Scenario 1 represents th e cas ein w hich th eestimated silver pr iceshocks ar e fed into th eVAR system whi leth eother shocks ar es et to zero. Scenario 2 (3) represents th eestimation in w hich th esilver pr iceshocks ar e fed into the VAR system, a llth eother shocks ar eshut off, and th eexchang er ate(silver stocks) is not allowed to respond to changes in silver price. Scenario 2 (3) el iminates th eeffects of silver pr iceshocks th at work through th eexchang er ate(silver stocks) channel. The figure shows th at if Chin aeconomy w asnot tied to silver, th eShangh aWPI would have been more stab lethan it actually was.

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可向通讯作者索取包含更多数据和图表的工作论文，作者感谢 Joshua Jr-shiang Gau 收集数据，感谢两位匿名审稿人深刻独到的评论和建议，尤要向为本文的最终付梓做出巨大贡献的编辑 Bill Collins 致以谢忱。